A New Account of the Genus *Horsfieldia* (Myristicaceae), *Pt 4**

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Ramuli validi, cristati, primum pilis 0.3-0.4 mm longis obtecti. Folia disticha vel sparsa, membranacea, elliptico-oblonga usque ad oblonga, 17-30 cm longa, nervis supra prominentibus. Perianthia mascula pubescentia, breviter obovoidea, c. 2.5 mm diam., 4-valvata. Androecium indistincte triquetrum an non, antheris 7, suberectis, in parte superiore liberis. Pedicellus pubescens, basi articulatus. — Type: *Rahmat si Boeea 9257* (L; iso: MICH, *n.v.*).

Tree 10 m. Twigs subterete, in the apical portion ± angular and ridged, lower down distinctly lined or ridged, 4-6(-15) mm diam., dark brown, glabrescent, hairs 0.3-0.4 mm; bark lower down finely to coarsely striate, lenticels not very conspicuous, older bark not flaking. Leaves in 2 or sometimes in 3 rows, membranous, elliptic-oblong to oblong, broadest above the middle, 17-30 × 6-11 cm, base ± long-cuneate, top rather shortly acute-acuminate; upper surface glabrous, drying brown-olivaceous, lower surface drying brown, glabrous but midrib ± late glabrescent, without scattered larger blackish dots; midrib above raised to rather flattish, glabrescent; nerves 15-20 pairs, above slender, raised, glabrous, the lateral arches usually ± sunken, distinct; tertiary venation forming a lax network indistinct above; petioles 15-25 × 2.5-3.5 mm, late glabrescent; leaf bud 8-10 × 4-5 mm, with hairs c. 0.3-0.4 mm. Inflorescences behind the leaves, densely rusty pubescent with hairs c. 0.3-0.6 mm; in ♂: 3 or 4 times ramified, rather many-flowered, 10-12 × 5-6 cm, common peduncle 35-40 mm, the flowers in clusters of 3-5 each; bracts elliptic-oblong, acute, 5-10 mm long, densely pubescent, caducous; flowers 3- or 4-valved, perianth pubescent with hairs 0.1-0.3 mm, pedicel pubescent with hairs 0.2-0.3 mm, at base articulate; ♀ inflorescence rather few-flowered, c. 4 cm long. Male perianth subglobose-obovoid, in transverse section rounded, collapsing slightly on drying, 2.2-2.5 × 2.0-2.5 mm, top broadly rounded, base ± rounded; pedicel 1.5-2.5 mm long; perianth at anthesis cleft from c. ½ to nearly ⅔, valves 0.3-0.4 mm thick. Androecium globose to obovoid, (1.2-)1.5 mm diam., subcircular to blunt-angular in cross-section; anthers 6 or 7, acutish, 0.7-0.8 mm long, free for c. ½-way, somewhat curved towards the centre, column largely hollowed out, the basal part of the androecium consisting of a tapering androphore 0.5-0.7 mm long. Female flowers not seen. Fruits 1-3 per infructescence, broadly ellipsoid-obovoid, top broadly rounded, base narrowly rounded and short-attenuate, 5.0-5.7 × 3.8-4.5 cm, glabrous, drying dark brown, sparsely coarsely tubercled, pericarp 10(-15) mm thick; stalk 2-3 mm long, pubescent; perianth not persistent.

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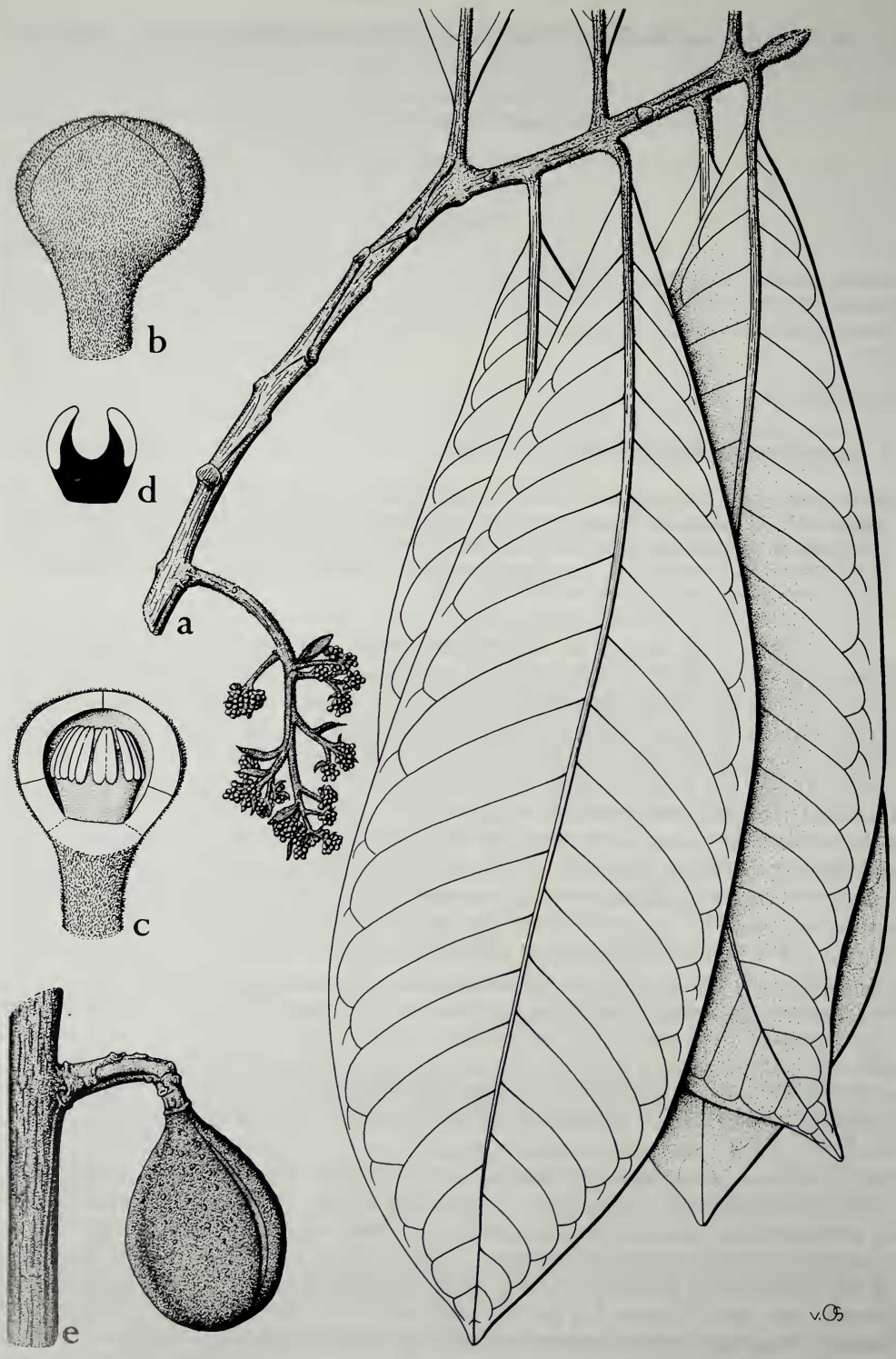

Fig. 27 *Horsfieldia hirtiflora* de Wilde.
a. leafy twig with immature male inflorescence, note lined twig, dispersed leaves and bracts present in inflorescence, × ½; *b,* submature male flower, lateral view, × 12; *c,* ditto, opened, showing androecium, × 12; *d,* immature androecium, longitudinal section, schematic, × 12; *e,* portion of twig with infructescence, fruit mature, × ½. — *a-d,* from *Rahmat si Boeea 9257; e,* from *Kostermans 22048.*

Distribution. Sumatra (Tapanuli, E. Coast).

SUMATRA. Tapanuli: *Kostermans 22048* — E. Coast: *Rahmat si Boeea 9257, 9362.*

Ecology. Forest, 100-500 m alt; on sandstone. Flowers June-July, fruits in December.

NOTES

1. Fieldnotes. Tree 10 m, diam. 12 cm. Bark rough, hard, black. Fruit yellow, subglobose, 8 cm diam.

2. Surely closely related to *H. brachiata* with which it has the distinctly ridged twigs in common, but differing by the coarser habit, larger and hairy flowers, and large fruits.

3. The leaves towards the apex of the twigs in *Kostermans 22048* and *Rahmat Si Boeea 9257* are not distichous but, rather, arranged in 3 rows.

4. Sinclair identified the specimen *Rahmat Si Boeea 9257* as *H. brachiata* var. *sumatrana, Rahmat Si Boeea 9632* as *H. brachiata* var. *brachiata.*

72. Horsfieldia brachiata (King) Warb. Fig. 1C(72).

Myristica brachiata King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 311, pl. 144 — *Horsfieldia brachiata* (King) Warb., Mon. Myrist. (1897) 325; Gamble, Mat. Fl. Mal. Penins. 5, 23 (1912) 218; Ridley, Fl. Mal. Penins. 3 (1924) 59 — *H. subglobosa* (Miq.) Warb. var. *brachiata* (King) Sinclair, Gard. Bull. Sing. 16 (1958) 431, fig. 51 E. — *H. brachiata* (King) Warb. var. *brachiata:* Sinclair, Gard. Bull. Sing. 28 (1975) 9 — Type: Malaya, *Scortechini 1649* (CAL, *n.v.;* iso: K, L), *King 4704* (CAL, *n.v.;* iso: K, L; BO, PDA, *n.v.*), *6771* (CAL, *n.v.;* iso: BM, K; FI, G, *n.v.*), *Griffith 4351* (CAL, *n.v.;* iso: K, P, U; A, G, M, S, *n.v.*).

Tree 10-35 m. Twigs ± angular or subterete, or more or less flattened towards the apex, almost always distinctly lined or ridged in between the petioles, or sometimes lines evident only in a part of the material, twigs towards the apex 2-7(-18) mm diam., grey-brown to blackish, generally early glabrescent from dark brown or rusty hairs (0.1-)0.2-0.4 mm long; bark lower down finely to coarsely striate, in colour not very contrasting with lenticels; bark when older not flaking. Leaves in two rows, membranous, elliptic-oblong to oblong(-lanceolate), broadest at or slightly above the middle, 12-26(-30) × 4-9(-11) cm, base cuneate, top acute-acuminate; upper surface glabrous, drying olivaceous to brown or sometimes blackish, with the midrib glabrescent, lower surface drying light brown, early glabrescent but midrib sometimes later glabrescent; not dotted; midrib raised above, glabrous; nerves 12-20 pairs, above slender, raised, glabrous, the lateral arches usually not distinct above; tertiary venation forming a lax network usually not distinct above; petioles 8-13(-20) × 2-3 mm, glabrescent; leaf bud 8-15 × 3-4 mm, with hairs 0.2-0.4 mm long. Inflorescences sparsely to densely pubescent with dendroid hairs 0.2-0.5 mm, sometimes partly glabrescent; in ♂: 3-4 times ramified, many-flowered, 7-18(-22) × 5-16(-18) cm, common peduncle 6-18 mm long, the flowers in loose clusters of 3-6; ♀-inflorescences rather many-flowered, 3-8 × 2-6 cm; bracts oblong-lanceolate, acutish, 3-5 mm long, pubescent, caduous; perianths 3 (or 4)-valved, glabrous; pedicels in ♂ pubescent in various degree with hairs 0.1-0.2 mm, in ♀ glabrescent, at base articulate. Male perianths subglobose or

slightly depressed-globose to broadly obovoid, in transverse section usually slightly angular, sometimes rounded, 1.0-1.5 x 1.2-1.8 mm, top (broadly) rounded, base rounded to short-cuneate, glabrous; pedicel (1.0-)1.5-2.5 mm long, slightly tapering or not; perianth at anthesis cleft to ½-⅔, not or but little collapsing on drying, valves 0.2-0.4(-0.5) mm thick. Androecium depressed-globose to obovoid in outline, (0.5-)0.7-1.0 × 0.8-1.2 mm, ± rounded or usually ± 3-angular in transverse section; anthers 6-10 (12-20 thecae), 0.5-0.7 mm long, mutually free for c. ½-way, usually curved towards the centre, column largely hollowed out, at base continuing into the 0.2-0.3-mm long androphore, slightly tapering or not. Female perianth broadly ellipsoid, 2.2-2.5 × 1.8-2.0 mm, glabrous, cleft at anthesis to c. ⅓, valves c. 0.3-0.4 mm thick, pedicels 1-1.5 mm long, glabrous, ovary ovoid, 1-1.4 × 0.8-1.2 mm, glabrous, stigma 2-lobed, c. 0.2 × 0.4 mm. Fruits 4-12(-20) per infructescence, broadly ellipsoid, top narrowly rounded, base (broadly) rounded, 2.0-2.8(-4.0, see notes) × 1.8-2.2(-3.0) cm, glabrous, drying brown to dark brown, not warted nor lenticellate, pericarp 1.5-4(-7) mm thick; stalk 1.5-3 mm long; perianth not persisting.

Distribution. Peninsular Thailand, Malaya (Kedah, Kelantan, Perak, Trengganu, Pahang, Malacca, Johore), Sumatra, Borneo (Sarawak, incl. one deviating coll., see notes; Sabah; E. & NE. Kalimantan); not found in Singapore and most of Kalimantan.

THAILAND. Peninsular: (*Larsen c.s.*) Fl. of Thailand *31184,* (*Phusomsaeng 424*) *36470,* (*Sangkhachand 1132*) *36570, 52357; A.F.G. Kerr 7426, 7690, 12426, 18185; Put 1184; Shimizu et al.* (Kyoto) *8181.*

MALAYA. *FRI 0417, 4941, 5606, 10387, 11424, 11872, 13310, 13743, 15307, 15807, 17562: Griffith* (d.d. 1845; *Kew Distr. 4351*); *Kep 94517, 94688, 98501, 100129, 104313, 104996; (Kunstler* in) *King 4704, 6771; KL* (of Malaya Univ.) *3095; Ridley 4459; Shah MS. 1541,* (*& Noor*) *1751; Scortechini 1649; SFN 23869, 25991, 28707, 28963, 29466, 31617, 33753, 34569, 34708, 36791, 40772.*

SUMATRA. E. Coast: *Bartlett 7110; Rahmat si Toroes 4124, 4657; Yates 1601* — Djambi: *Roos & Franken 1653* — Palembang: *Lambach 1341.*

BORNEO. Sarawak: *S 34908* (large fr., see notes), *39162* — Sabah: *Amdjah 1088; San 21509, 48435, 69290, 74417, 74544* NE. & E. Kalimantan (incl. Tarakan, E. Kutei): *Kostermans 4988, 5078, 9018, 9171; Meÿer 2259, 2380, 2385.*

Ecology. Primary and secondary lowland rain forest; often in flatland forest, marshy forest, riverside forest, peaty forest, forest on alluvial plains, poor forest on soil with stagnant water, but also on hill sides; found on alluvial soils, brown soil, sandy soil (in *Tristania* forest, Sabah), sandstone, peaty soils, loam soil with lime; often near streams; 0-400 m alt. Flowers and fruits throughout the year.

Vernacular names. Pĕrĕdah boeroeng (Palembang), *Kajoe darodong* (Tapanoeli).

NOTES

1. Fieldnotes. Usually a slender tree, with straight bole once recorded as with buttresses to 50 cm high. Bark ± smooth, pale brown to dark brown, generally shallowly vertically fissured c. 1 cm apart, sometimes recorded as ± laminated or scaly, or cracked. Living bark 8-10 mm thick, pinkish to reddish-brown, exuding reddish sap. Wood whitish to pale brown; no heartwood. Twigs with raised lines. Flowers greenish-yellow to dark yellow, scented. Fruits yellow-green, yellow or yellow-orange.

2. The present species is largely the same as *H. subglobosa* var. *brachiata* or *H. brachiata* var. *brachiata* as delimited by Sinclair in 1958 and 1975 respectively. I also agree that it is very close to *H. polyspherula;* in fact, it stands in several respects more or less between the vars. *polyspherula* and *sumatrana* of *H. polyspherula. H. brachiata* is in most cases easily recognized by its weak to strong raised lines on the twigs on both sides from petiole to petiole. Its fruits are rather uniform in shape and size, 20-28 mm long, and thus ± intermediate between *H. polyspherula* var. *polyspherula* and var. *sumatrana* (see there). *H. brachiata* has the leaves rather like those of *H. polyspherula* var. *sumatrana, viz.* generally membranous, and drying to pale, dull olivacous above, and pale cinnamon below. Its flowers are rather uniform, mature male buds 1.2-1.8 mm diam., with a usually ± triquetrous androecium (but see note 3) consisting of 6-10 stamens, and they do not differ from those of *H. polyspherula* s.l. Sterile and flowering specimens, in which the apical and lower twig portions are not sufficiently represented may be difficult to place.

Note that *H. brachiata* generally has stouter inflorescences in contrast with *H. polyspherula.* The former occurs quite commonly in evergreen forests in Peninsular Thailand, where *H. polyspherula* is not found yet.

3. Variation. The number of anthers in the androecium is usually 6-8, only in the material from Peninsular Thailand did I find 9 or 10.

The shape of the mature male perianths in bud is generally subglobose or short-obovoid, with the transverse section faintly 3-angular, corresponding with the generally angular shape of the androecium. Only in a few specimens from Malaya (*FRI 0417, Kep 94517, 104313*) are the mature male buds rather depressed-globose and circular in section; also the androecium in these specimens is ± rounded in section, but otherwise there is no reason to exclude them from the present species.

The specimen *SFN 40772,* from Trengganu, Malaya, is a relatively glabrous plant. The twigs are almost glabrous, including the apex, and the tomentum of the leaf bud is composed of hairs only c. 0.1 mm long.

4. Some deviating and doubtful specimens. FRI 17562, from Perak, Malaya, has twig apices rather sharply 2-angled, and hence would belong to *H. brachiata.* The older wood sample, however, is not lined, the fruit is also relatively large, c. 30 × 26 mm, and the colour of the dry leaves rather blackish. Probably this specimen belongs to *H. polyspherula* var. *sumatrana.*

The Malayan specimens *King's Coll. 6771* (syntype) and *KEP 100129* are also somewhat doubtful because of the rather indistinct lines on the twigs.

S 34908 from Sarawak (Kapit, 5th Div.) is a stout specimen and in bad condition; it has ♀ flowers and at L is a single fruit measuring c. 40 × 30 mm; the pericarp is ± woody, c. 5-7 mm thick. *H. brachiata* is not common in Sarawak and this large-fruited specimen probably represents a separate taxon. It was collected in a kerangas-mossy forest at c. 800 m, the highest altitude ever collected of the species.

73. Horsfieldia pachyrachis de Wilde, *sp. nov.* Fig. 1C(73)

Ramuli validi, primum pilis c. 0.2 mm longis obtecti, deinde glabrescentes. Folia chartacea, 16-26 × 6.5-9 cm, nervis supra prominentibus. Inflorescentiae masculae validae, costa 5-8 mm diam. Perian-

thia mascula subglobosa, 1.5-2 mm diam., 3-valvata. Androecium triquetrum, antheris 5-7, erectis. Pedicellus basi articulatus. — Type: *b.b. 28128* (L; iso: K; BO, SING, n.v.).

Tree. Twigs terete, towards the apex 5-7 mm diam., blackish-brown, glabrescent, tomentum rusty to grey-brown with hairs c. 0.2 mm, bark of older twigs not seen; lenticels conspicuous. Leaves in 2 rows, thinly chartaceous, obovate-oblong to oblong, broadest at or somewhat above the middle, 16-26 × 6.5-9 cm, base (long-)attenuate, top broadly acutish; upper surface drying olivaceous brown to blackish brown, glabrous, lower surface drying dark brown, without larger blackish dots, early glabrescent but on the midrib towards the base tomentum vestigial with hairs 0.2-0.3 mm; midrib rather slender above, near the transition of the petiole 2.5-3 mm wide, raised; nerves 14-17 pairs, raised above, the marginal arches not very distinct; tertiary venation forming a lax network, flat or ± sunken, indistinct; petioles 7-11 × 3.5-4.5 mm, glabrescent; leaf bud c. 15 × 4 mm, with hairs c. 0.2 mm. Inflorescences apparently behind the leaves (see notes), densely to sparsely pubescent with dendroid hairs 0.2-0.3 mm, glabrescent, in ♂: very stout and rather compact, 4 or 5 times ramified, many-flowered, c. 14 x 10 cm (not fully expanded), the main axis stout, towards the base 5-8 mm diam., length of common peduncle not known (see notes); flowers in clusters of 4-10, perianth 3-valved, glabrous, pedicel thinly pubescent towards base with hairs 0.1-0.2 mm long, at base distinctly articulate; bracts caducous, those of uppermost ramifications ± elliptic, subacute, densely pubescent, 3-5 × 2-4 mm. Male perianth (possibly somewhat submature) broadly globose to broadly obovoid, apically slightly depressed, c. 1.5 × 2.0 mm, top broadly rounded, base ± narrowly rounded, glabrous; pedicel 1.5-2.0 mm long; perianth at anthesis cleft to nearly ½-way, hard-fleshy, not collapsing on drying, valves 0.2-0.3 mm thick at sutures, perianth towards the base 0.5-0.7 mm thick. Androecium subglobose-obovoid, c. 0.6 × 0.6 mm, rather sharp-triangular in transverse section; anthers 5-7 (i.e. 10-14 thecae), slightly curved, almost entirely connate, concealing an apical cavity in the central column reaching c. ¼-½-way; androphore slightly tapering towards the base, 0.1-0.2 mm long. Female flowers and fruits not seen.

Distribution. Borneo, W Kalimantan; only known from *b.b. 28128,* Melawi, Bukit Kelawai, 80 m alt., ♂ fl., 20 May 1939; no further ecological or fieldnotes given.

NOTES

1. The present species is described as new because it does not fit into any of the species which it resembles in general habit, i.e., the leafy twig and flowers. The separate male inflorescence is extremely stout, with the main axis (rachis) c. 5-8 mm thick and with shortish and stout lateral axes, and by this character it keys out easily. Most of the numerous flowers are submature, but the largest ones apparently are nearly full-grown. These highly resemble superficially those of the group of species with *H. polyspherula* (especially those of var. *sumatrana*) or *H. laticostata,* also in the distinctly triquetrous androecium. However, in the *H. polyspherula*-group of species the (sub)erect anthers are mutually largely free, at least for c. ½-way, whereas in our present species the anthers are (almost) completely connate. Also in general habit and the colour of the leafy twig, it agrees little with the *H. polyspherula* group. The connate anthers (and the general appearance of the leaves) point to the group of species keyed out around *H. fragillima,* and the specimen on which the present new species is based would then key out beside *H.*

borneensis (because of the distinctly articulated pedicels), a species which does not appear related at all.

2. The only collection on which the present species is based, *b.b. 28128,* consists in L of a leafy twig and, in a separately attached envelope, a part of an inflorescence, apparently broken off from the specimen in Kew. The K-specimen only consists of a stout, slightly submature inflorescence, cut-off close to its base, and there are no leaves. I have not seen the BO and SING duplicates. The collection was identified by Sinclair (1975, p. 12) as *H. brachiata* var. *laticostata* (my present *H. laticostata*), but Sinclair remarks: 'somewhat approaching robust specimens of var. *sumatrana* but probably best here'.

Unfortunately West Kalimantan is still strongly undercollected, as is also apparent from the specimen *Hallier 624* from the same area; this latter seems to represent a new species as well, as is discussed in note 3 under *H. valida.*

The collection *b.b. 28340,* sterile, from the same locality as the type (Melawi, B. Melaban Kenjit, 470 m), resembles the type and may be conspecific; this was determined by Sinclair as *H. fragillima.*

74. Horsfieldia ridleyana (King) Warb. Fig. 1C(74)

Myristica ridleyana King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 311, pl. 145 — *Horsfieldia ridleyana* (King) Warb., Mon. Myrist. (1897) 331; Gamble, Mat. Fl. Mal. Pen. 5, 23 (1912) 221; Ridley, Fl. Mal. Pen. 3 (1924) 60; Burk., Dict. 1 (1935) 1199; Sinclair, Gard. Bull. Sing. 16 (1958) 432, fig. 52; 28 (1975) 108 — Type: Malaya, *Cantley 1768* (K, syntype); King's Coll. 10917 (CAL, *n.v.* iso: BM, K, L; syntype); *Scortechini (12)* (♂ fl., lectotype, annotated by King; BM, K, iso:L), *862* (♀ fls. syntype; CAL, *n.v.;* iso: K).

Horsfieldia karengasicola Sinclair, *in sched.* (Borneo material).

Tree 5-25 m. Twigs terete or somewhat angular, towards the apex 1.5-3.5(-5) mm diam., dark brown, generally early-glabrescent, tomentum rusty, with hairs c. 0.2-0.4 mm long, bark lower down finely to coarsely striate, lenticles either small and distinct, or absent; older bark not flaking. Leaves in 2 rows, thinly chartaceous to coriaceous, elliptic-oblong to lanceolate, broadest at about the middle, 5-15(-16) × 2-4.5 cm, base attenuate, top acute to acute-acuminate; upper surface glabrous, drying olivaceous to brown, lower surface glabrous, drying light brown to reddish-brown, sometimes rather contrasting with upper surface, without larger blackish dots; midrib above flat, sunken or slightly raised, and often inconspicuous, glabrous; nerves 7-15 pairs, above sunken to flattish, inconspicuous or often hardly visible; tertiary venation forming a lax network, not or hardly visible; petioles 7-15 × 1.5-2.5 mm, early glabrescent; leaf bud slender, 6-14 × 1-2 mm, densely pubescent with hairs 0.2-0.5 mm long. Inflorescences rather sparsely pubescent with hairs 0.1-0.3 mm, sometimes subglabrous or glabrescent, in ♂: c. 3 (or 4) times ramified, rather many-flowered, 2-6 × 2-4 cm, common peduncle (2-) 5-15 mm long, the flowers in loose clusters of 3-6 each; ♀-inflorescences fewer-flowered, c. 1.5-4 cm long; bracts not seen, caducous; perianths 3-or 4-(rarely 2-) valved, glabrous, pedicels slender, glabrous, at base articulated. Male perianth subglobose, or ± shortly ellipsoid, 1.0-1.2 × 0.8-1.2(-1.3) mm, top rounded, base rounded or short-attenuate, glabrous; pedicel 1.0-2.0 mm long, slender; perianth at anthesis cleft to c. ⅓- nearly ½, not or slightly collapsing on drying, valves 0.2-0.4 mm thick. Androecium (incl. androphore) broadly obovoid, 0.6-0.8 × 0.4-0.7 mm,

in transverse section generally sharply 3- or 4-angular (rarely ± ellipsoid in 2-valved flowers); anthers 4-6 (i.e., 8-12 thecae), mutually almost entirely free (Malaya, Borneo), or free only nearly for upper half (part of the material from Malaya), sub-erect, acutish, c. 0.3-0.4 mm long; androphore relatively long, ± tapering, up to nearly the length of anthers, 0.2-0.4 mm long. Female perianth ellipsoid, c. 1.5-1.8 × 1.5 mm, glabrous, cleft at anthesis to ⅓- nearly ½-way, valves 0.2-0.4(-0.5) mm thick; pedicels 1.0-2.0 mm long; ovary ellipsoid, 1.2-1.3 × 0.6-0.7 mm, ± grooved at one side, glabrous, stigma shallowly 2-lipped, c. 0.1-0.2 × 0.6 mm. Fruits 1-6 per infructescene, ellipsoid, top and base rounded, 1.5-2.0 × 1.0-1.4 cm, glabrous, drying brown, without lenticel-like tubercles, pericarp c. 1.5 mm thick; stalk 2-5 mm long; perianth not persisting.

Distribution. Malaya (Perak, Kelantan, Trengganu, Pahang, Selangor, Malacca), Borneo (Sarawak, Brunei, Sabah); apparently not in Sumatra (see notes).

MALAYA. *FRI 7404, 8334, 14321, 14729, 20023, 20626; Kep. 94376, 98171, 99117; King's Coll. 10917; Ridley 16177; Scortechini s.n. (12), 862.*

BORNEO. Sarawak: *Purseglove P. 5607; S 15925, 20925, 21540, 32200, 37632, 37681, 38438, 38579; Sinclair & Kadim 10406, 10406A.*

BRUNEI: *(Ashton) BRUN 3277; Sinclair & Kadim 10438* — Sabah (Beaufort Dist.): *San. 31427, 49267.*

Ecology. Usually in forest on poor soils: heath forest (with *Dacrydium beccarii*), kerangas forest, ridge-forest, quartzite conglomerate-ridges, exposed ridges; sandstone with very shallow soil, with *Gymnostoma, Tristania, Cotylelobium;* sandstone ridges with *Dipteris;* sandstone summits with *Dacrydium, Gymnostoma*-forest; 0-1100 m alt. Flowers throughout the year, but in Borneo most collections June to October; fruits throughout the year.

NOTES

1. Fieldnotes. Slender or crooked trees, once recorded on a hill side as having many buttresses. Bark dark brown to red brown, shallowly (rectangular) fissured, shallowly cracked, flaky, or shallowly dippled and fissured. Slash bark reddish, fibrous, laminated, once recorded as notably dense; sapwood pale, whitish, creamy pink. Flowers yellow; androecium (stamens) pink; ovary pale green. Fruits glossy, green turning yellow-green.

2. Specimens *Kep 99117* and *FRI 20023,* both from Pahang, Malaya, have proportionally many 2-valved flowers in the inflorescences. Such flowers slightly deviate by their shorter androecium, with shorter androphore, and the androecium not conspicuously triquetrous but rather subellipsoid in transverse section.

3. The material from Malaya generally has less coriaceous leaves and thicker tomentum on the leaf-bud (c. 0.4 mm) as compared with most of the material from Sarawak, Brunei, and Sabah. Specimens from Borneo generally are from heath or kerangas forest, those from Malaya from ridges and hill slopes.

4. An excluded specimen. I have to exclude the specimen *Sinclair & Kadim 10453* from Brunei, which Sinclair probably used for the description of the fruits, c. 3-4 × 2-2.8 cm, in his publication of 1975, p. 109. In my opinion *H. ridleyana* has essentially smaller fruits, c. 15-20 mm long. The specimen *Sinclair &*

Kadim 10453 differs furthermore by its much thicker pericarp (c. 8 mm), thinner leaves, the slightly raised lateral nerves on the upper leaf surface, and rather differing aspect of the bark of the older twigs; I cannot match it with any species known to me, and it is described here as a new species, *H. disticha.*

5. The only specimen seen by me from Sumatra, which may represent *H. ridleyana,* is *b.b. 6479,* a sterile specimen from W. Coast at 1000 m. This differs from the material from Malaya (which it resembles most) by the coarser tomentum on leaf bud and twig apex, and the midrib rather raised above. Possibly *H. ridleyana* does not occur in Sumatra, and the specimen *b.b. 6479* may belong instead to a new species *H. triandra* which is based on *Forbes 2465.*

6. Vegetatively *H. ridleyana* may be confused with *H. penangiana.* In Borneo *H. ridleyana* may resemble *H. oligocarpa*, but the latter has distinctly raised nerves on the upper leaf surface.

75. Horsfieldia obtusa de Wilde, *sp. nov.* Fig. 1C(75)

Gemma pilis 0.2-0.4 mm longis obtectum. Folia coriacea, oblonga, 8-10 cm longa, apice rotundata, nervis c. 10 paribus, supra planis. Perianthium masculum subglobosum, c. 1.5 mm diam., 3-valvatum. Androecium triquetrum, antheris 9 vel 10, suberectis, in parte dimidia superiore liberis. Pedicellus basi articulatus. — Type: Sarawak, *(Native Collector) Bureau of Science 821* (L).

Tree. Twigs terete or faintly angular, towards the apex 2.5-4(-6) mm diam., grey-brown, rather late glabrescent, tomentum dark rusty, with hairs 0.2-0.4 mm long, bark lower down rather coarsely striate, when older finely, longitudinally cracking; lenticels present but small and inconspicuous. Leaves in 2 rows, thinly coriaceous, oblong, broadest at about the middle, 8-10 × 3-3.5 cm, base attenuate, top rounded; upper surface glabrous (except midrib), drying dark olivaceous, lower surface glabrous (early glabrescent), drying somewhat purplish brown, provided with many paler usually pale yellowish enlarged hair-scars but not dotted; midrib above moderately raised, late glabrescent, nerves c. 10 pairs, flat or slightly raised above, well-visible, the submarginal arches rather regularly shaped and well-visible; tertiary venation forming a lax network, not or hardly visible; petioles c. 10 × 2 mm, rather late glabrescent; leaf bud c. 12 × 3 mm, densely dark rusty pubescent, hairs 0.2-0.4 mm. Inflorescences situated behind the leaves, densely pubescent, rusty hairs 0.2-0.4(-0.5) mm long, in ♂: c. 3 times ramified, many-flowered, 5-9 × 3-5 cm, common peduncle 3-10 mm long, the flowers in clusters of 3-6 each; ♀ inflorescences not seen; bracts not seen, caducous. Flowers 3(or 4)-valved, perianth glabrous, pedicel glabrous, terete, at base articulate. Male perianth subglobose, 1.3-1.5 × 1.5-1.6 mm, top and base broadly rounded; pedicel 1-1.5 mm long, slender; perianth at anthesis cleft to nearly ½-way deep, ± woody-brittle, not collapsing on drying, valves at the top c. 0.2 mm, at base c. 0.4 mm thick. Androecium (incl. androphore) broadly obovoid, c. 0.8 × 1.0 mm, in transverse section 3 (or 4)-quetrous; anthers 9 or 10 (thecae 18 or 20), c. 0.5 mm long, suberect, free in the upper half, acutish; androphore ± tapering to below, c. 0.3 mm long; apical cavity rather distinct, depth to about the base of the anthers. Female flowers and fruits not seen.

Distribution. Only known from the type from Sarawak, precise locality not indicated.

Ecology. Not known.

NOTES

1. Obviously a member of the group of species with *H. polyspherula,* because of the articulated pedicel and the angular androecium with the anthers distally free. It is distinguished by its generally flat nerves and the rather large male flowers with 9 or 10 anthers. Because of the smallish coriaceous leaves with rounded tip it is reminiscent of *H. montana,* but that species has quite different male flowers. Similar large, pale yellowish hair-scars on the leaves can be found in *H. xanthina,* a species quite different in various ways.

2. Sinclair identified the type specimen in 1959 as *H. montana,* a species which in 1975 he reduced to *H. glabra,* but the present type-collection was not included among the cited specimens.

76. Horsfieldia disticha de Wilde, *sp. nov.*

Ramuli non-angulati, primum pilis 0.2-0.3 mm longis obtecti deinde glabrescentes, deorsum cortice longitudinaliter fisso. Folia disticha, chartacea, oblongo-lanceolata, 8-13.5 cm longa, longe acuminata, nervis supra prominentibus. Fructus ovoideo-ellipsoidei, c. 3 cm longi, glabri, pericarpio (in sicco) 8-10 mm crasso. — Type: Brunei, Sinclair (& Kadim) *10453* (L; iso: BM, K; A, B, E, NY, SAR, SING, *n.v.*).

Tree 20 m. Twigs terete to faintly angular, not ridged, towards the top 2-3(-4) mm diam., in fruit-bearing portion 11-13 mm diam., dark grey-brown or dull reddish-brown, very early glabrescent, tomentum dull rusty, of hairs 0.2-0.3 mm, bark lower down coarsely longitudinally cracking, lenticels rather sparse but distinct. Leaves in 2 rows, chartaceous, oblong-lanceolate, broadest at about the middle or ± parallel-sided, 8-13.5 × 2.5-3.5 cm, base ± rounded to short-attenuate, tip long-acute-acuminate (acumen c. 15 mm); upper surface drying olivaceous-brown, glabrous, lower surface pale chocolate, glabrous, without larger scattered dots; midrib raised above, glabrous; nerves 9-13 pairs, raised above, the marginal arches indistinct; tertiary venation faint or invisible on both surfaces; petioles relatively long and slender, glabrous, 10-15 × 1-1.5 mm; leaf bud slender, c. 10 × 2 mm, densely dull rusty pubescent with hairs 0.2-0.3 mm long. Male and female flowers not seen but perianth apparently 3-valved as judged from the perianth-scars on the fruits. Fruits 3-6 in infructescences measuring 3-6 × 2-4 cm, borne on the older wood behind the leaves, glabrous (glabrescent), the fruits ovoid-ellipsoid, top narrowly rounded, base broadly rounded, 2.8-3.2 × 2.1-2.5 cm, glabrous, drying dark brown, not tubercled nor lenticellate, pericarp hard-woody when dry, 8-10 mm thick; stalk 10-15 mm long; perianth not persistent.

Distribution. Borneo: Brunei, known only from the type.

Ecology. Lowland forest, at side of new road, Andulau Forest Reserve (West); fruits in August.

NOTES

1. Fieldnotes. Bark with longitudinal, shallow furrows as in *H. wallichii.* Twigs slender, leaves distichous, dark green above, paler beneath, dull on both surfaces. Fruits unripe, pear-shaped, large.

2. According to the general habit of the specimens, and especially the leaves with the nerves raised above, this species obviously belongs to the group of *H. polyspherula.* It was, together with some other specimens, provisionally identified as *H. disticha* by Sinclair. In his posthumous publication these specimens were listed as *H. ridleyana,* and I agree, except for the collection *Sinclair & Kadim 10453* on which the present new species is based. *H. disticha* differs from *H. ridleyana* in its general habit, the raised nerves, the nature of the bark on the twigs, and the much larger fruits with a conspicuously thick pericarp. In fact, the above specimens were used by Sinclair to describe the fruits of *H. ridleyana,* but it seems to me that the fruits of that species are different, being smaller and with a much thinner pericarp.

77. Horsfieldia tenuifolia (Sinclair) de Wilde, *stat. nov.* Fig. 1C(77); 28

Horsfieldia polyspherula var. *tenuifolia* Sinclair, Gard. Bull. Sing. 28 (1975) 105. — Type: *Haji Bujang S 13686* (SING, *n.v.;* iso: K, L; S, SAR, *n.v.*).

Tree 5-15 m. Twigs terete, towards the apex 1-3(-4) mm diam., early glabrescent, tomentum greyish-rusty, hairs c. (0.1-)0.2 mm, bark of older twigs striate, lower down neither cracking nor flaking; lenticels inconspicuous or absent. Leaves in 2 rows, membranous to thinly chartaceous, elliptic to oblong-lanceolate, broadest at about the middle, 6.5-16.5 × 3-6.5 cm, base attenuate, top acute-acuminate; upper surface drying greyish olivaceous to dark greyish brown, glabrous, lower surface dull greyish brown, glabrous, without larger blackish brown dots; midrib raised above, glabrous; nerves 5-11 pairs, raised above, marginal arches regular but rather faint; tertiary venation forming a lax network, indistinct or hardly visible; petioles 8-16 × 1.5-2 mm, glabrous; leaf bud 5-8 × 1-1.5 mm, densely pubescent with hairs c. 0.2(-0.3) mm. Inflorescences moderately to sparsely pubescent with stellate hairs 0.1-0.2 mm, in ♂: rather many-flowered, c. 3 times ramified, 3-5 × 2-4 cm, common peduncle 2-10 mm; in ♀: rather slender, few-flowered, c. 2-3.5 × 1 cm; bracts elliptic to oblong, 2-3 mm, pubescent, caducous. Flowers in loose clusters of 3-8 each, perianth 3-(or 4-)valved, glabrous, pedicels glabrescent or with few scattered hairs up to 0.2 mm in the lower half, at base indistinctly or not articulate. Male perianth globose to broadly obovoid, 0.8-1.3 × 1.0-1.5 mm, top broadly rounded, base rounded to subattenuate, glabrous; pedicels 1-2 mm long, somewhat tapering; perianth at anthesis cleft to depth of c. ⅓ to nearly ½-way, valves 0.2-0.3 mm thick, at base up to 0.4 mm thick. Androecium ± obovoid to ellipsoid, 0.5-0.7 × 0.5-0.8 mm, in transverse section triquetrous; anthers 4-6, sub-erect, 0.3-0.4 mm long, mutually free for at least ½-way, central column largely hollow, towards the base continued into the somewhat tapering androphore 0.2-0.3 mm long. Female perianth ellipsoid, c. 2.0 × 1.5 mm, cleft at anthesis to c. ⅓ or slightly over, valves c. 0.3 mm thick, pedicel c. 1.5 mm long, at base ± articulate or inarticulate, glabrescent, hairs 0.2-0.3 mm; ovary ellipsoid, c. 1.3 × 0.8-0.9 mm, glabrous, stigma 2-lobed, c. 0.2 mm high. Fruits 1-3 per infructescence, ellipsoid, top rounded, base rounded or shortly tapered, 1.7-2.0 × 1.4-1.5 cm, glabrous, drying dark brown, not lenticel-like tubercled, pericarp 1-1.5 mm thick; stalk 3-5 mm long; perianth not persistent.

Distribution. Borneo: Sarawak (1st. Div.), Sabah (Beaufort Hill, Jesselton).

BORNEO. Sarawak: *S 12774, 13686, 24914, 24945, 26599, 34528; Sinclair & Kadim 10179* — Sabah: Jesselton, *Kep. 71665;* Beaufort Hill, *San. 44531.*

Fig. 28. *Horsfieldia tenuifolia* (Sinclair) de Wilde.
a. habit of twig with leaves and male inflorescences, × ½; *b,* ditto with female inflorescence, × ½; *c,* mature male flower, lateral view, × 12; *d,* ditto, opened, showing androecium, × 12; *e,* mature female flower, × 12; *f;* ditto, opened, showing glabrous ovary and minute 2-lipped stigma, × 12; *g,* portion of twig with infructescence, fruits mature, × ½ — *a, c, d,* from *S 24945, b, e, f,* from *S 34528; g,* from *S 24914.*

Ecology. Lowland dipterocarp forest, 0-300 m alt.; soil a yellow clay, yellow sandy clay, yellow loam, brownish soil; on ridges and slopes. Flowers and fruiits May to September.

NOTES

1. Fieldnotes. Slender tree, once recorded as buttressed. Bark dark brown to greenish brown, narrowly fissured, not flaking; inner bark dark red, with red latex; sapwood whitish. Flowers greenish yellow. Fruits yellowish.

2. Sinclair regarded the present species as a variety of *H. polyspherula,* and some specimens were included by him in the type-variety, *H. polyspherula* var. *polyspherula.*

Our present species is marked by quite a different habit; it has the twigs glabrous to the top, the leaf bud is small and slender, covered with hairs only c. 0.2 mm long; the leaves are membranous to thinly coriaceous, not brittle, drying to a greyish tinge and the colour of the upper and the lower surfaces not markedly different; the petioles are relatively long and slender; the inflorescences and flowers are comparatively small. According to the architecture of the male flowers the species is undoubtedly closely related to *H. polyspherula.* The present species is an understorey tree of the lowland dipterocarp forest on richer soils.

3. S 34528, with female flowers, has the twigs rather pale and contrasting with the darker colour of the dry leaves and petioles; by this feature, it may vegetatively key out to the group of species, incl. *H. oligocarpa,* characterized by a pale colour of the dry twigs.

A much related species is *H. macilenta,* also with thin membranous leaves, but it has much more pubescent twigs and inflorescences

78. Horsfieldia macilenta de Wilde, *sp. nov* Fig. 1C(78)

Ramuli tenues. Gemma pubescens pilis c. 0.5 mm longis. Folia membranacea, oblonga usque ad oblongo-lanceolata, 10-18 cm longa, basi attenuata, nervis lateralibus paribus 10-15, supra prominentibus. Perianthium masculum subglobosum, c. 1 mm diam., 3-valvatum. Androecium triangulare ad sectionem transversam, antheris 5-7, suberectis, in parte dimidia superiore liberis. Pedicellus basi articulatus. — Type: Sabah, *A. Gibot SAN. 37103* (L).

Tree 4-17 m. Twigs terete, towards the apex 1-3(-12) mm diam., rather late glabrescent, tomentum pale rusty, composed of stellate-dendroid hairs (0.2-)0.5 mm long, bark of older twigs rather finely striate, not cracking; lenticels small and usually inconspicuous. Leaves in 2 rows, membranous, oblong to oblong-lanceolate, broadest at about the middle, 10-18(-27) × 3-6.5 cm, base (rounded to short-)attenuate, tip acute-acuminate; upper surface drying dull olivaceous, glabrous, lower surface rather bright light brown, glabrous except midrib and the very base; without larger, dark brown dots; midrib raised above, on lower surface late glabrescent; nerves 10-15(-18) pairs, raised, the marginal arches fairly regular, distinct or not; tertiary venation forming a lax network, ± indistinct; petioles 10-15 × 1.5-2.0 mm, rather late glabrescent; leaf bud 6-8 × 1.5 mm, densely pubescent with hairs (0.2-)0.5 mm. Inflorescences rather sparsely woolly-pubescent with hairs (0.2-)0.5 mm, in ♂: many-flowered, 2 or 3(-4) times ramified, 4-9(-10) × 3-5(-7)

cm, common peduncle 3-12 mm long; ♀ inflorescences similar to the males (see notes);bracts oblong to lanceolate, 2-5 mm, pubescent, caducous. Flowers in ♂ in clusters of 5-8, perianth 3-valved, glabrous or sometimes a few minute hairs less than 0.1 mm are present towards the base of the pedicel; pedicel terete, glabrous or sparsely pubescent in the lower portion with hairs 0.1 mm or less, distinctly articulate at base. Male perianth globose to depressed globose, 0.7-1.2 × 1.0-1.2 mm, top and base (broadly) rounded; pedicels c. (0.8-) 1.0(-1.3) mm long; perianth at anthesis cleft to nearly ½-way, valves 0.2-0.3 mm thick. Androecium subglobose, (incl. androphore) 0.4-0.5 × 0.5-0.7 mm, in transverse section triangular; anthers 5-7, suberect, 0.3-0.4 mm long, at least the upper half mutually free, column largely hollow and passing into the broad ± tapering androphore c. 0.2-0.3 mm long. Female perianth (see notes) subglobose, c. 1.5 mm diam., cleft at anthesis to c. ½-way, valves c. 0.4-0.5 mm thick, pedicel c. 1.5 mm, subglabrous, only in the lower part with a few scattered hairs less than 0.1 mm long, base articulate; ovary globose, glabrous, 1.0-1.2 mm diam., stigma minutely 2-lipped, (0.1-)0.2 mm long. Fruits (in Sumatra) 2 or 3 together in a short infructescence 2-3 cm long, the fruits glabrous, ellipsoid, 2.2-2.4 × 1.5-1.6 cm, top rounded, base contracted into a 2-4-mm long narrowed portion, pericarp c. 2 mm thick, drying brown, not or sparingly tubercled; stalk c. 5 mm long; perianth not persistent.

Distribution. Sumatra, Malaya, Borneo (Sarawak, Sabah).

Cultivated Bot. Garden Bogor (orig. unknown): sub IV.H. 29 (Oct. 1912), in herb. L.

MALAYA (Kelantan, Johore): *Whitmore FRI 4415; Kadim & Noor KN. 185.*

SUMATRA (Jambi Prov.): *Roos & Franken T.F.B. 1999.*

BORNEO. Sarawak (4th Div.): *Hirano & Hotta 1206; S 39027* — Sabah: *B.N.B. For. Dept. 4204; A. Gibot SAN 37103; SAN 53268.*

Ecology. Primary lowland mixed dipterocarp forest, swamp forest; 0-200 m alt. Flowers from June to November.

NOTES

1. Fieldnotes. Outer bark whitish or green-yellow, inner bark red with latex red, cambium yellowish. Flowers greenish yellow to yellow.

2. Clearly much related to *H. polyspherula* especially to the slender specimens of var. *polyspherula,* according to the structure of the male flowers. The present species differs by many details in general habit such as its more slender and tiny build: the slender twigs, the thinly membranous leaves and the slender and tiny inflorescences.

3. I am not quite sure whether the only known female flowering specimen (*S. 39027*) belongs here. Its leaf nervation is a trifle more projecting, and the marginal arches are regular and distinct, the pubescence on the leaf bud, twig apex, and inflorescence is shorter than in the four male specimens presently known, *viz.* c. 0.2 mm long versus c. 0.5 mm in the male specimens. Remarkable are the female inflorescences which are as much-branched as the male; all flowers are mature and purely female. In the related *H. polyspherula* the female inflorescences are always noticeably smaller as compared with the males. In the fruiting specimen *T.F.B.*

(*Roos & Franken*) *1999*, from Sumatra. the infructescence is, as expected, only 2-3 cm long.

4. Specimens of the present species were included by Sinclair (1975) in *H. polyspherula;* he did not see others.

79. Horsfieldia laticostata (Sinclair) de Wilde, *stat. nov.* Fig 1C(79)

Horsfieldia brachiata (King) Warb. var. *laticostata* Sinclair, Gard. Bull. Sing. 28 (1975) 12 — Type: *Sinclair 10265* (K; iso: L; A, E, SAR, SING, *n.v.*).

Tree 12-35 m. Twigs terete, towards the top 3-8(-15) mm diam., grey-brown to blackish, early glabrescent, tomentum grey-brown to rusty, composed of hairs 0.1-0.4 mm, bark lower down coarsely striate, when older almost flaking, lenticels usually distinct. Leaves in 2 rows, thinly to thickly coriaceous, obovate-oblong to oblong, broadest at or somewhat above the middle, (15-)20-33 × 6-12 cm, base attenuate, top (short-)acute-acuminate; upper surface drying dull olivaceous to greenish brown, glabrous, lower surface drying chocolate brown to rusty, rather contrasting with the upper surface, without blackish dots or markings, early glabrescent; midrib above raised, ± slender to broad but towards the base flattish and conspicuously broadened to 3-4(-5) mm wide at the transition to the petiole, glabrous or sometimes with some remnants of tomentum towards the base; nerves 11-20(-24) pairs, largely raised but towards the blade margin sunken, the marginal arches usually ± distinct, sunken; tertiary venation forming a lax network, flat or sunken, distinct or not; petioles stout, 6-15 × 5-8 mm, early glabrescent; leaf bud 15-23 × 3-5 mm, densely grey-brown to rusty pubescent with hairs 0.1-0.4 mm long. Inflorescences rather sparsely pubescent with hairs 0.2-0.4 mm long, in ♂: stout, 4 or 5 times ramified, many-flowered, 10-25 × 8-22 cm, main axis towards base 3-4 mm diams., common peduncle 5-35 mm long; ♀ inflorescences 3-7 cm long, 2 or 3 times ramified, rather few-flowered; bracts elliptic, acute, 2-8 × 1-4 mm, pubescent with hairs c. 0.3 mm, ± glabrescent, caducous; flowers 3-valved, in clusters of up to 10, perianth glabrous, pedicel glabrous except sometimes towards base a few hairs are present, 0.1-0.2 mm, at base distinctly articulate. Male perianth broadly obovoid to subglobose, 1.3-1.5 mm diam., top broadly rounded, base rounded or sometimes ± attenuate, glabrous; pedicel (1.0-)1.5(-2.0) mm long, slender; perianth at anthesis cleft to c. ½-way, not collapsing on drying, valves 0.2-0.3 mm, towards base of perianth c. 0.5 mm thick. Androecium including androphore broadly obovoid in outline, c. 0.7 mm diam., sharp-triangular in transverse section; anthers 6 (thecae 12), suberect, acutish, mutually largely free, c. 0.3(-0.4) mm long; androphore ± tapering, c. 0.3-(0.4) mm long. Female perianth broadly ellipsoid-globose, c. 2.5 mm diam., glabrous or with a few minute hairs c. 0.1 mm long, cleft at anthesis to c. ⅓, valves 0.3-0.4 mm thick, pedicel 0.5-1 mm long; ovary broadly ovoid, c. 1.5 mm long, glabrous, stigma c. 0.1 mm long, shallowly 2(-4)-lobed. Fruits 1-4 per infructescene, ellipsoid, top and base rounded, 2.8-4.0 × 2.2-2.5 cm, glabrous, drying brown, with or without warts or lenticels, pericarp c. 4-5 mm thick; stalk 2-4 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Sabah, N.E. Kalimantan.

BORNEO. Sarawak: *Chew Wee-Lek CWL. 637; Haviland 3074; S 13689, 17252, 18519; Sinclair 10265* — Sabah: *B.N.B. For. Dept. 2487; San A 2995, 32602 N.T. 223, 67215, 74585, 80429, 83709* — E. & NE. Kalimantan: *Kostermans 4355, 8777, 9010, 9321.*

Ecology. Primary peat swamp forest, forest on sandy acid soils, waterlogged sand soils, heath forest, karengas, poor forest; 0-400 m alt. Flowers and fruits throughout the year.

Vernacular name. Piasau piasau (Kedayan lang., Sabah).

NOTES

1. Fieldnotes. Tree to 35 m, without buttresses. Branches predominantly horizontal. Bark hard, fissured or flaky, brown to reddish-brown; inner bark reddish, laminated, sapwood whitish. Flowers yellow, smelling of Peru balsam. Fruits yellow, orange or red; once recorded as "fruiting abundantly throughout the crown along the smaller branches". Seed shining white, spotted.

2. According to Sinclair (p. 12, 13) this is a robust ecological form of *H. brachiata* var. *sumatrana* (in this treatment *H. polyspherula* var. *sumatrana*). Indeed, the present species seems closely related to *H. polyspherula*, especially to the varieties *sumatrana* and *maxima*, but I prefer it to keep it a separate species as it can usually be satisfactorily distinguished and as such it does not further complicate the still very variable *H. polyspherula-complex;* similarly I have treated *H. oligocarpa* as a separate species, which is also very close to *H. polyspherula*, but separable on various grounds, including a distinct habitat in heath forest.

The present species seems largely confined to forests on poor soils; peaty and sandy grounds. It is characterised by the stout twigs, large coriaceous leaves with the midrib very broad and flat at the transition to the petiole, the usually stout, broad petioles, the fruits of moderate size (c. 30-40 mm), and the large, stout, male inflorescences. In size and architecture of the male flowers (perianth and androecium) it is very similar to *H. polyspherula.*

80. Horsfieldia nervosa de Wilde, *sp. nov.* Fig. 1C(80)

Gemma pilis c. 0.5 mm longis obtectum. Folia tenuiter coriacea, oblonga, 16-28 cm longa, basi subrotundatis, nervis later-alibus paribus 16-19, supra prominentibus. Perianthium masculum globosum, c. 1.2 mm diam., 3-valvatum. Androecium triangulare ad sectionem transversam, antheris 5 vel 6, erectis, in parte dimidia superiore liberis. Pedicellus basi articulatus. — Type: Sarawak, *Ilias Paie & P.S. Ashton S 16652* ((L; iso: K; S, NB, A, M, B, *n.v.*).

Tree 13-16 m. Twigs terete or towards the apex subterete, 3.5-6(-8) mm diam., grey-brown, not early glabrescent, tomentum rusty, with hairs 0.3-0.6 mm long, bark lower down coarsely striate, with the lenticels rather inconspicuous, older bark slightly flaking or not. Leaves in 2 rows, thinly coriaceous, oblong, broadest ± at the middle, 16-28 × 5.5-9 cm, base short-attenuate to rounded, top acute-acuminate; upper surface drying olivaceous to greenish, largely glabrous but midrib and nerves late glabrescent, lower surface chocolate colour, conspicuously contrasting in colour with the upper surface, without larger blackish dots, glabrescent but tomentum of hairs c. 0.5 mm often partly remaining on nerves especially the midrib; midrib slender above, at transition of petiole c. 1.5 mm wide, distinctly raised, late-glabrescent; nerves 16-19 pairs, above conspicuously raised, glabrescent, the lateral arches flattish, indistinct; tertiary venation forming a lax network, indistinct or hardly visible; petioles 15-22 × 3.5-4.5 mm, (late) glabrescent; leaf bud 16-20 × 3.5-4.5 mm, densely rusty pubescent with hairs c. 0.5 mm long. Infloresc-

ences seen only on the older wood behind the leaves, densely pubescent with woolly-shaggy hairs up to 0.6 mm long, in ♂: c. 4 times ramified, many-flowered, c. 10 × 10 cm, common peduncle 10-20 mm long, the flowers in clusters of 2-6 each; ♀ inflorescences fewer-flowered, c. 4.0 × 3.5 cm; bracts pubescent, caducous; flowers 3-valved, perianth glabrous, pedicel towards base pubescent with hairs 0.1-0.2 mm, articulate at base. Male perianth globose, c. 1.2 mm diam., top and base ± rounded, glabrous; pedicel c. 1.5 mm long; perianth at anthesis cleft to nearly ½-way, not collapsing on drying, valves c. 0.2 mm thick, at base of perianth ± fleshy-coriaceous, 0.5-0.6 mm thick. Androecium incl. androphore ± broadly obovoid, c. 0.6-0.7 × 0.6 mm, triquetrous in transverse section; anthers 5 or 6, (thecae 10 or 12), at least the upper half free, ± erect, c. 0.3-0.4 mm long; column deeply hollowed; androphore ± tapering to the base, c. 0.3 mm long. Female perianth subglobose, c. 2.5 mm diam., subglabrous with some scattered hairs c. 0.1 mm towards base, cleft at anthesis to slightly over ⅓, valves c. 0.5 mm thick, pedicels c. 1.5(-2.0) mm long, ± pubescent with hairs 0.1-0.2 mm; ovary broadly ovoid, c. 1.5 mm diam., glabrous, stigma c. 0.3 ×0.6 mm, 2-lobed, the lobes very shallowly 5 or 6-lobulate. Fruits not seen.

Distribution. Borneo (Sarawak, 1st Div.); known from two collections only.

Ecology. Primary forest on yellow podsolic soil; c. 70 m alt. Flowers in November.

NOTES

1. Fieldnotes. Bark pale ochre and brown-mottled, smooth. Buttresses thin, small, to c. 35 cm tall. Flowers pale yellow.

2. This species is a close relative of *H. polyspherula;* its male flowers are practically identical. The known specimens, *S 16651* (♀), and *16652* (♂), both from Bt. Gaharu, Serian Dist., are somewhat different especially in the leaves; those of *H. polyspherula* are generally smaller, with fewer lateral nerves and generally an attenuate base. In our present species the nerves on the upper leaf surface are very strong and markedly raised and distinct, and midrib and nerves on both surfaces remain for rather a long time covered with the indumentum. Sinclair did not seem to have seen these two specimens.

81. Horsfieldia polyspherula (Hook. f. emend. King) Sinclair Fig. 1C(81)

Myristica polyspherula Hook. f., Fl. Brit. Ind. 5 (1886) 108 (p.p., see notes by Sinclair, o.c., 1958, p. 425; 1975, p. 103); King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 312, pl. 146, *emend.* — *Horsfieldia polyspherula* (Hook. f. *emend.* King) Sinclair, Gard. Bull. Sing. 16 (1958) 422, fig. 47, pl. XII B; 28 (1975) 101, p.p., for the type-variety only. — Lectotype (Sinclair, p. 103): *Griffith 4354* (K; iso: BM, P, U; C, CAL, CGE, FI, G, S, *n.v.*).

For further synonyms see under the varieties.

Tree 4-35(-40)m. Twigs terete or subterete, never distinctly lined nor ridged, 2-5(-13) mm diam., grey-brown to blackish, early to rather late glabrescent, tomentum dark rusty 'mealy', composed of dendroid hairs 0.1-0.6 mm long; bark lower down finely to coarsely striate, lenticels distinct or not, older bark neither cracking nor flaking. Leaves in 2 rows, thickly membranous to chartaceous, usually brittle,

(elliptic-)ovate-oblong to oblong-lanceolate, broadest usually at the middle, 7-28 × 2.5-9 cm, base subrounded to usually attenuate, top acute-acuminate; upper surface glabrous, drying greenish, olivaceous, or greenish-brown, the midrib glabrous (early glabrescent), lower surface drying light brown to red or chocolate-brown, usually much contrasting with the upper surface, without any larger brown or blackish dots, early glabrescent but with the midrib often late glabrescent; midrib slender; nerves 6-15 pairs, above very distinctly raised (except close to the blade margin), glabrous, the lateral arches usually indistinct above; tertiary venation forming a lax network usually not or hardly visible above; petioles 6-15 × 1.5-3.0 mm, early to rather late glabrescent; leaf bud 6-17 × 1.5-3.0 mm, pubescent by rusty dendroid hairs 0.1-0.6 mm long. Inflorescences rather sparse to densely woolly-pubescent with hairs c. 0.6 mm long, sometimes glabrescent, in ♂: 3-5 times ramified, many-flowered, 4-15 × 3-12 cm, common peduncle 3-15 mm long, the flowers usually in clusters of up to 8 each; ♀ inflorescences few- to many-flowered, generally smaller than the males, up to 8 cm long; bracts oblong to lanceolate, c. 1.5-7 mm long, densely pubescent, caducous; perianths 3-valved, glabrous or in ♀ glabrescent, pedicel glabrous or minutely pubescent towards the base which is articulate. Male perianth globose or broadly obovoid, 1.0-1.8 mm diam., top (broadly) rounded, base rounded or rarely ± tapering into the pedicel, glabrous; pedicel slender, sometimes tapering, 0.8-1.5(-2.0) mm long; perianth at anthesis cleft to ½-⅔, not collapsing on drying, valves 0.2-0.4, at base up to 0.6 mm thick. Androecium (incl. androphore) ± broadly obovoid in outline, 0.5-0.8 × 0.6-1.0 mm, usually sharp-triangular in transverse section; anthers (3 or) 4-7 (thecae 6-14, free), almost completely free, at least the upper half, ± curved or suberect, 0.3-0.5 mm long, apex acutish, at base attached to the short bowl-shaped column which continues into the relatively long ± tapering androphore (0.2-)0.3-0.4 mm long. Female perianth broadly ellipsoid-obovoid, 2.0-3.0 × 1.8-2.8 mm, glabrous or sparingly pubescent (hairs c. 0.1 mm), cleft at anthesis to ⅓-½, valves towards base c. 0.5 mm thick, pedicels 1-1.8 mm long, minutely pubescent; ovary ovoid-ellipsoid, 1.2-1.5 × 1.0-1.5 mm, glabrous, stigma shallowly 2-lobed, c. 0.2-0.3 × 0.5 mm. Fruits 1-6 per infructescence, subglobose to ellipsoid, top rounded, base rounded or slightly attenuate, 1.9-6.0 × 1.4-5.0 cm, glabrous, drying light to dark brown, not lenticel-like tuberculate, pericarp 2-15 mm thick; stalk 1-4 mm long; perianth not persisting.

Distribution. Malaya, Sumatra, Borneo, Philippines (Mindanao, only the var. *polyspherula*) 0-1100 m altitude.

NOTES

1. A very variable species. After having segregated some closely related species such as *H. oligocarpa, H. tenuifolia,* and *H. laticostata* (all 3 from Borneo), *H. brachiata* (Sumatra to Borneo), and *H. majuscula* (Malaya), I found that the remaining specimens from the same island-areas are still heterogenous. Much variability is found in the habit of the plants, i.e., the thickness of the twigs, size and texture of leaves, denseness of the indumentum on leaf bud and twig apex, and especially in fruit size and thickness of the pericarp. On the basis of mainly fruit characters, three rather heterogenous varieties are presently recognized. There are slight differences in the size of the male perianth, attributed mainly to the varying thickness of its valves; the number of anthers is possibly the same in all three varieties.

2. The anthers are composed of two rather widely separated, almost mutually free thecae, giving the impression as if there are twice as many anthers as are present. Thus, Sinclair gave the number of anthers as 9-12 for *H. polyspherula* (1958, p. 22) and 8-13 for *H. subglobosa* (sensu Sinclair, l.c. p. 426, but *H. polyspherula* as treated here).

KEY TO THE VARIETIES

1a. Fruits (when dry) (3.5-)4.0-6.0 cm long, the pericarp 5-15 mm thick. Leaves 9-20 cm long, nerves 9-15 pairs. Male flowers not known ..... **c.** var. **maxima**

b. Fruits up to 3.5 cm long, the pericarp 2-5 mm thick 2

2a. Fruits (2.5-) 2.8-3.5 cm long. Male perianth 1.2-1.8 mm diam.; anthers 6 or 7. Leaves 13-28 cm long, nerves 12-15 pairs ..... **b.** var. **sumatrana**

b. Fruits 1.9-2.5(-2.8) cm long. Male perianth 1.0-1.5 mm diam.; anthers (3 or)4-7. Leaves 7-19 cm long, nerves 6-15 pairs ..... **a.** var. **polyspherula**

a. var. **polyspherula** Fig. 1C(81)

Horsfieldia lemanniana auct. non (A. DC.) Warb: Warb., Mon. Myrist. (1897) 326 (type of basionym *Myristica lemanniana* excluded).

Myristica globularia auct. non. Bl.: Hook.f. & Th., Fl. Ind. (1855) 160; A. DC., Prod, 14, 1 (1856) 202, p.p., for the specimens from Malacca.

Twings 2-3 mm diam. towards the apex; leaf bud covered with hairs (0.2-) 0.3-0.6 mm long. Leaves 7-19 × 2.5-6 cm, lateral nerves 6-15 pairs. Male perianth 1.0-1.5 mm diam.; anthers (3 or 4)-7. Female perianth 2.0-2.5 mm long. Fruits 1.9-2.5(-2.8) × 1.4-2.0; cm, pericarp 2-4 mm thick.

Distribution. Malaya, Singapore, Sumatra, Borneo (Sarawak, rare; Sabah, E. Kalimanthan), Philippines (Mindanao, 1 collection).

MALAYA. (Kedah, Perak, Trengganu, Pahang, Selangor, Malacca, Johore): *Derry 1216; FRI 0491, 0642, 0650, 2795, 4348, 4357, 4381, 4435, 4483, 11348, 13172, 14304, 16448, 17279, 021619, 023913, 27532, 28361; Griffith 4354; Hassan Rani H. 86; Kadim & Noor KN. 185, KN. 422; KEP 21593, 38129, 71903, 83478, 85230, 85231, 98919, 99802; King's Coll. 3309, 7526, 10431; Maingay 1002, 1003A, 1003, 1286; Shah & Noor MS. 1947; Ridley 4162, 7629; Scortechini (211a) 911a; SFN, 29366, 31976, 32109, 36122, 40288.*

SINGAPORE. *Maxwell 82-226; SFN (Ngadiman) 34630, (Sinclair) 39601, 40681, 40711*

SUMATRA. Northern (Langkat): *de Wilde & de Wilde-Duyfjes 19390, 19484, 19485* — East Coast: *Bartlett 7304* — Central (Paryakumbuh): *Maradjo 285* — Riau: *Soepadmo 101* — Djambi: *Posthumus 833, Roos & Franken 1968* — Palembang; *b.b. E. 851* —Bangka: *Kostermans & Anta 593.*

BORNEO. Sarawak (1st, 4th & 7th Div.): *S 38598, 39112, 40980, 41279* — Sabah: *Puasa Angian 3918; San 17186, 17244, 21159, 21487, 30450, 31129, 32209, 32283, 37103, 49349, 53020, 62802, 73995, 76070, 80798, 80957, 82599* — Kalimantan: West (Landak), *Teysmann s.n.* — E & NE.: *Kostermans 8658, 9285; Meijer 2137, 2398; Nedi 719* — SE.: *Hubert Winkler 2526.*

PHILLIPPINES. NE. Mindanao (Agusan Prov.): *Mendoza 61-409* (= *PNH 42247*).

Ecology. Lowland forest, most often on sandy soils; also *Casuarina* forest (E. Borneo), fresh water swamp forest, ridge-top forest, kerangas forest (Sarawak, rare); 0-900 m alt. Flowers throughout the year, but most collections June to September; fruits throughout the year.

Vernacular names. Tjemanding (Palembang, Sum.), Manggoe mangkiras (Landak, West Kalimantan).

NOTES

1. Fieldnotes. Slender tree with narrow crown, the branches often almost in whorls. Bark fissured, rarely flaky; inner bark mostly yellow to reddish, fibrous. Wood whitish to ochre-brown. Flowers at first jade-green, at anthesis yellow to orange-yellow with faint sweet odour when crushed. Fruits greenish yellow to orange.

2. The type-variety var. *polyspherula* agrees with Sinclair's *H. polyspherula* as treated in Gard. Bull. Sing. 16, 1958, p. 422 and largely with *H. polyspherula* var. *polyspherula* as treated in Gard. Bull. Sing. 28, 1975, p. 102.

3. The leaves, as in var. *sumatrana* are usually brittle when dry and often fragmented in herbaria. Dry leaves are usually greenish above and contrast well with the light to chocolate-brown of the lower surface. The tomentum of the leaf bud and young twig apex is rather long, the hairs 0.2-0.6 mm, i.e., on the average slightly longer than in the other varieties.

4. As var. *polyspherula* is mainly characterized by smaller fruits, it is often difficult to tell whether specimens with fruits just over 25 mm are those of var. *sumatrana* or var. *polyspherula.*

5. Specimens from the kerangas forest of Sarawak (e.g., *S 38598*) somewhat deviate by their stouter habit and less contrasting colour of the dry leaves, being more brownish yellow rather than greenish. Var. *polyspherula* is apparently rare in Sarawak.

b. var. **sumatrana** (Miq.) de Wilde, *comb. nov.*

Myristica glabra Bl. var. *sumatrana* Miq., Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 49 — *Horsfieldia brachiata* (King) Warb. var. *sumatrana* (Miq.) (Sinclair ex Whitmore, Tree Flora Malaya 1 (1972) 325, nom. inval., basionym wrongly cited and without literature ref.) Sinclair, Gard. Bull. Sing. 28 (1975) 13 (p.p., excl. syn. *H. majuscula* and *H. bartlettii*) — Type: *Korthals s.n.* (L; iso: K, U; B†; A, BP, BR, MEL. S, *n.v.*), W. Sumatra.

Myristica integra Wall., Cat. (1832) no. 6799, nom. nud.

Myristica collecttiana King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 312, pl. 147 — Syntype: Malaya, *King 3620* (CAL, *n.v.*), *3899*, lecto (CAL, *n.v.;* iso: K, P: FI, G, *n.v.*), *6672* (CAL., *n.v.;* iso: PDA, SING, *n.v.*), *6737* (CAL, *n.v.;* iso: BM. K.L).

Horsfieldia subglobosa auct. non (Miq.) Warb.: Warb., Mon. Myrist. (1897) 328; Gamble, Mat. Fl. Mal. Pen. 5, 23 (1912) 220; Ridley, Fl. Mal. Pen. 3 (1924) 60 — *H. subglobosa* [*non* (Miq.) Warb.] var. *subglobosa auct.:* Sinclair, Gard. Bull. Sing. 16 (1958) 425, 426, fig. 48-50, 51A-D (p.p., excl. syn. *H. majuscula*).

Twigs 2-4 mm diam. towards apex; leaf bud covered with hairs 0.1-0.4 mm long. Leaves 13-28 × 4.5-9 cm, lateral nerves 12-15 pairs. Male perianth 1.2-1.8 mm diam., anthers 6 or 7. Female perianth c. 3 mm long. Fruits (2.5-) 2.8-3.5 x 2.2-2.7 cm, the pericarp 3-5 mm thick.

Distribution. Malaya, Singapore, Sumatra, Borneo.

MALAYA (specimens seen from Kedah, Perak, Kelantan, Pahang, Selangor, Negri Sembilan, Johore): *FRI 1138, 1690, 2637, 3026, 4012, 5776, 6900, 6959, 7851, 9353, 11610, 12339, 12498, 13823, 20400, 25263; KEP 95006, 98976, 100129, 104913, 104996, 115988; King's Coll. 3899, 6004, 6737; Shah & Kadim 362; Md Nur 34117; SFN 32064, 35779; Soepadmo c.s. F.S.C. 831.*

SINGAPORE. *SFN 39599, 39697, 39989, 40043; Wallich 6799.*

SUMATRA. W. Coast: *Korthals s.n.* — East Coast: *Bartlett 6867; Krukoff 4138; Soepadmo 15, 193* — Siberut Isl.: *Iboet 311* — Belitung: *Vorderman (50).*

BORNEO. Sarawak: *S 12751, 13987, 16956, 20888, 34059, 34813, 37289, 37881, 38576, 39574, 39761* — Brunei: *Fuchs & Muller 21168; Van Niel 4053; Sinclair & Kadim 10414* — Sabah: *Elmer 21338, 21364; San. 16284, 25045, 28152, 30403, 32932, 46674, 63866, 72321, 73228, 78219, 82022.* — Kalimantan. West: *Hallier 2141;* East: *Endert 2114, 5088, 5091; Kostermans 4448, 6093, 7721, 10176, 10696, 12613; Wiriadinata 1194;* NE. (Nunukan Isl.(: *Kostermans 8746; Meijer 2032, 2259; Payments 5.*

Ecology. Lowland mixed dipterocarp forest, ridge forest, montane forest, mossy dipterocarp forest; also in heath forest, peat swamp forest, swamp forest and kerangas; on sandy and sandy-loamy soils, 'red' soil, yellow clayey soil; 0-1100 alt. Flowers and fruits throughout the year.

Vernacular names. Kajang (Lubok Antu reg., Sarawak, 2nd. Div.); Kumpang lusoh (Sarawak, Semengoh F.R., 1st Div.; it means 'lazy kumpang' which refers to the slow combustion of wood which is not dry.

NOTES

1. Fieldnotes. Tree usually slender, bole straight, without buttresses, crown slender, branching monopodial, branches horizontal. Bark generally dark brown, rather smooth, shallowly to fairly fissured, sometimes flaky (strips 10-20 mm wide). Inner bark reddish, fibrous, laminated, kino profuse, colourless then deep red; slash wood (sap-wood) whitish to cream; cambium whitish; heartwood pinkish. Flowers yellow to waxy yellow; fruits glossy green, turning greenish yellow, yellow, or orange; aril bright orange-red to red.

2. The tomentum of the leaf-bud in specimens from Sumatra (incl. the type of var. *sumatrana*), is quite short, the hairs only c. 0.1 mm long; the tomentum in specimens from Malaya and Borneo is usually longer, and rough with hairs c. 0.4 mm long.

3. Where fruits are less than 30 mm long, leaves smallish and twigs rather slender, specimens may be difficult to distinguish from var. *polyspherula.*

4. Some specimens from East Kalimantan such as *Kostermans 7721* (Samarinda), *10696* (Central Kutai; both ♂ flowers), and *12613* (W. Kutai, fruits) slightly deviate in habit by their thinner, membranous leaves, which dry to a paler brownish colour; the flowers and fruits are not different, although Kostermans remarks that the fruits of *12613* are wine red, a colour as yet unrecorded for the other, fairly abundant, fruiting collections.

5. Deviating specimens. Two, *King's Collector* (Goping) *6004* (syntype of *H. majuscula,* not the lectotype), from Perak, Malaya, c. 200 m alt., with male flowers, and *Md, Nur 34117,* from Selangor, at low alt., also with male flowers, obviously belong to the *H. polyspherula*-complex according to the subglobose shape of the male perianth, and shape and architecture of the androecium. As regards their general habit both specimens agree with var. *sumatrana,* but differ by their larger perianth, c. 1.8-2.0 mm diam, and, accordingly, larger androecium, c. 1.0 × 0.8 mm; there are 5 or 6 anthers (10 or 12 thecae). Possibly they link up with the normal flowers of var. *sumatrana,* which is mainly characterised by fruit-size, and of which the true variation in flower size I am not certain of.

c. var. **maxima** de Wilde, *var. nov.*

Ramuli haud prominulo-lineati. Folia nervis lateralibus supra prominentibus instructa. Fructus sicco (3.5-)4-6 × 3-5 cm, pericarpio (5-)8-15 mm crasso. — Type: Sarawak, 7th Div., *Paul Chai S 36228* (L; iso: K; SAR, KEP, MO, SAN, *n.v.*).

Twigs towards apex 2-4 mm diam.; leaf bud covered with hairs 0.2-0.5 mm long. Leaves 9-20 × 3.5-7 cm, lateral nerves (6-)9-16 pairs. Flowers not seen. Fruits (3.5-)4.0-6.0 × 3.0-5.0 cm, the pericarp (5-)8-15 mm thick.

Distribution. Borneo

BORNEO. Sarawak: *S 17027, 32244, 36228, 37188, 38498* — Sabah: *San. A 1735, 25593, 48793, 66747, 86049.* — E. Kalimantan: *Kostermans 13023; Leighton 908.*

Ecology. Mixed forest, *Agathis* forest; on sandy water-logged soil, sandy loam or yellow clay-loam soil; 50-500 m alt. Fruits throughout the year.

NOTES

1. Fieldnotes. Tree recorded both as with and as without buttresses. Bark shallow boat-shaped fissured. Inner bark pinkish. Wood medium soft, whitish yellow. Fruits yellow to red.

2. The present variety differs mainly by its conspicously large and almost globose fruits with a very thick pericarp. It may be confused with *H. majuscula* from Malaya, a species which was reduced by Sinclair (l.c., p. 13) to *H. brachiata* var. *sumatrana* (the latter presently treated as *H. polyspherula* var. *sumatrana*). *H. majuscula* differs from *H. polyspherula* by the size of the male flowers (the flowers of var. *maxima* are unknown) with a differently shaped androecium, by the different leaf colour and by the slightly different fruits with a thinner pericarp.

Fruiting specimens of *H. polyspherula* var. *maxima* may also be confused with *H. punctatifolia,* which differs by its typical punctate leaves.

82. Horsfieldia oligocarpa Warb. Fig. 1C(82)

Horsfieldia oligocarpa Warb., Mon. Myrist. (1897) 354, t. 22 fig. 1-3 — *Myristica oligocarpa* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3. 1 (1900) 87 — *H. polysherula* (Hook. f.) Sinclair var. *oligocarpa* (Warb.) Sinclair. Gard. Bull. Sing. 28 (1975) 104 — Syntype: *Beccari 2066* (fruits, FI acc. no. *7620,* lecto; iso: K. P), *s.n.* (♂ fl., FI acc. no. *7621, n.v.*).

Tree 4-20 m. Twigs terete, towards the apex 2-3(-4) mm diam., at the very apex dark grey-brown, early glabrescent, lower down bark striate, generally pale yellowish or whitish-brown, contrasting with the dark colour of the dry petioles, lenticels small, at first distinct, lower down inconspicuous, bark when older not flaking. Leaves in 2 rows, chartaceous, elliptic-oblong to oblong, broadest at the middle, 7-16 × 2.5-6 cm, base attenuate, top acute-acuminate, upper surface glabrous, drying usually grey-greenish, dull, lower surface generally bright rusty or chocolate-brown, contrasting much with the upper surface, glabrous including midrib, without blackish marks; midrib above raised, glabrous; nerves 8-11 pairs, above slender, raised; tertiary venation indistinct or invisible on both surfaces: petioles 6-12 × 1.5-2.5 mm, drying blackish brown; leaf bud 7-10 × 2-3 mm, covered with

dense grey-rusty tomentum of hairs c. 0.2 mm long, the tomentum early shed in the form of small crust-like pieces. Inflorescences rather sparsely pubescent with stellate hairs 0.2-0.3 mm long, sometimes glabrescent, in ♂: 2 or 3 times ramified, 3-6 × 1.5-4 cm, common peduncle 5-10 mm long, few-flowered, the flowers in clusters of 3-8 each; ♀ inflorescences not seen, according to the infructescences c. 1.5-4 cm long; bracts not seen, caducous; flowers 3-valved, perianth glabrous, pedicel glabrous, at base articulate. Male perianth globose to broadly obovoid, 1.0-1.7 mm diam., top broadly rounded, base ± rounded, glabrous; pedicel 1-1.5 mm long, slightly tapering; perianth at anthesis cleft to nearly ½-way, ± coriaceous, not collapsing on drying, valves towards base up to 0.5 mm thick. Androecium (incl. androphore) ± obovoid, c. 1.0 × 1.0 mm, in transverse section triangular; anthers 6 or 7 (thecae 12 or 14), anthers and thecae largely mutually free, c. 0.5 mm long, tip acutish, at base attached to a short column which continues into the somewhat tapering androphore c. 0.5 mm long. Female perianth not seen. Fruits 1-4 per infructescence, ellipsoid, top and base rounded, 1.8-2.7 × 1.4-1.9 cm, glabrous, drying brown to dark brown, not to hardly lenticellate, pericarp 2-3 mm thick; stalk 2-5 mm long; perianth not persisting.

Distribution. Borneo (Sarawak, Brunei)

BORNEO. Sarawak (1st, 3rd & 4th Div.): *Beccari s.n.* (FI acc. no *7621, n.v.*), *2066; Native Coll. 821; S 16219, 19470; Yacub 8255* — Brunei: (Ashton & Whitmore) *BRUN 398, 635; Brunig S 4402; Sinclair & Kadim 10414, 10430, 10452, 10503* (= *H. bicolor* Sincl. *in sched.*).

Ecology. Forest on poor soils: white sand, white podsolic sand, yellow sand, sandstone, 'terraces', sand and peat, once recorded from a ridge; heath forest; 0-50 m alt. Flowers in June, August; fruits August to October.

Vernacular name. Kumpang puteh.

NOTES

1. Fieldnotes. Shrub or tree, buttresses absent. Bark grey and dark brown, to reddish brown, fissures c. ¼-½ in. wide; c. 9 in. long; inner bark pink brown, soft, c. 1 cm thick, sap red; sapwood pink-yellow, soft. Timber firm. Leaves pale green, dull, not glaucous beneath. Fruit pale yellow to orange; pear-shaped, ± pointed at apex. Flowers light brown.

2. This species is identical with *H. polyspherula* var. *oligocarpa* as treated by Sinclair (p. 104), who regards it as a distinct ecological variety. I agree that it is extremely close to *H. polyspherula,* especially to var. *polyspherula,* as it has fruits of about the same size. Because I accept three varieties within the polymorphous *H. polyspherula,* mainly on the basis of different fruit-sizes (though some sizes overlap), the present *H. oligocarpa* could be treated as a variety based on quite different grounds. I prefer to keep it apart as a separate species because it has a strikingly different general appearance and its own distinct ecology. *H. oligocarpa* seems to be restricted to low forest and heath forest on very poor sandy and peat soils at low altitudes. The plant stands out by the overall pale colour; the older twigs are pale, whitish brown to straw; the leaves dry a dull pale green above, contrasting strongly with the bright brown, or rusty, copper, or chocolate-brown of the lower leaf surface (more contrasting than is usually the case with *H. polyspherula*); the inflorescences are rather small and not many-flowered, ± glabrescent; the flowers are markedly coriaceous (?always). Sinclair named some of the specimens

as *H. bicolor* Sincl. *in sched. H. polyspherula* grows generally on richer soils, and the twigs dry always to grey-brown to brown; the leaves are generally of a less paler green; and the perianths are not coriaceous or slightly so.

83. Horsfieldia endertii de Wilde, *sp. nov.* Fig. 1C(83)

Ramulorum apices atque gemmae pubescentes pilis scabris 0.3-0.6 mm longis. Folia coriacea. Perianthium masculum 3-valvatum, ellipsoideum, 2.5-3.5 × 2-2.5 mm. Androecium ellipsoideum, sessile, antheris 10-14, sessilibus, pedicello basi non-articulato. — Type: E. Kalimantan, *Endert 3996* (L; iso: K; A, BO, *n.v.*).

Tree 4-25 m. Twigs terete, towards the top 2.5-4(-8) mm diam., dark or blackish brown, early to rather late glabrescent, tomentum rough, deep rust, composed of hairs 0.3-0.6 mm; bark coarsely striate, with coarse and conspicuous, paler lenticels, older bark tending or not to flake. Leaves in 2 rows, coriaceous to strongly coriaceous, elliptic-oblong to oblong-lanceolate, broadest generally at the middle, 8-17(-26) × 3-6(-10) cm, base rounded to (short-)attenuate, tip rounded to subacute; upper surface glabrous but base of midrib late glabrescent, drying olivaceous or yellowish to dark-brown, lower surface drying pale brown to chocolate, not much contrasting with the upper surface, without larger blackish marks but with usually large and conspicuous, pale yellowish hair-scars (lens, × 60), glabrous but the midrib towards the base sometimes late glabrescent; midrib above relatively broad, raised, glabrous but towards base late glabrescent; nerves 8-15 pairs, above sunken, flattish, or slightly raised, the submarginal arches fairly regular-shaped and sometimes distinct; tertiary venation forming a lax network, generally indistinct or invisible on both surfaces; petioles 6-16 × 2-3.5(-4) mm, glabrescent; leaf bud 10-20 × 3-4 mm, with hairs 0.3-0.6 mm. Inflorescences densely and rather shaggy-pubescent with rusty hairs 0.5-1.0 mm long, in ♂: 2 or 3 times ramified, not very many-flowered, (1.5-) 3-10 × (1-) 2-5 cm, common peduncle 5-20 mm long, the flowers in clusters of (1-)2-6 each; ♀ inflorescences ± few-flowered, 1 or 2 times ramified, 2-4 cm long; bracts broadly ovate-ellipsoid, 3-7 mm long, densely pubescent, caducous; flowers 3-(or 4-) valved, perianth glabrous (glabrescent), pedicel minutely puberulous, hairs 0.1-0.3 mm, especially in the lower half, at base inarticulate. Male perianth ± obovoid (when immature) to ellipsoid, 2.5-3.5 × 2.0-2.5 mm, top and base rounded, glabrous; pedicel 2-3 mm long; perianth at anthesis cleft to ⅓-½-way, only slightly collapsing on drying, valves c. 0.3 mm thick. Androecium ± sessile, obovoid to truncate-ellipsoid, 2.0-2.8 × 1.4-1.6 mm, in transverse section sub-triangular; anthers (10-)12-14 (c. 24-28 thecae), almost completely sessile, 2.0-2.8 mm long, free at apex for only 0.1 mm or less, column solid except for the narrow apical hollow or slit reaching to ⅕-⅓ deep; androphore narrow, (0-)0.1-0.3 mm long, hidden by the anthers. Female perianth broadly ovoid-ellipsoid, 2.5-3 × 2-2.5 mm, glabrous, split at anthesis to ⅓-½, valves 3, at sutures 0.3-0.5 mm thick, pedicels 1.5-2.0 mm long, towards the base with hairs c. 0.2 mm, inarticulate, ovary ovoid-ellipsoid, c. 2 × 1.5 mm, glabrous, stigma c. 0.2 mm high, minutely 2-lobed. Fruits 1-4(-8) per infructescence, ellipsoid, base rounded, top rounded to acutish, 3.0-4.2 × 1.6-2.4 cm, glabrous, drying grey-brown to dark brown, without or with a few lenticel-like tubercles, pericarp 2-4 mm thick; stalk 3-5 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Sabah, E. Kalimantan.

BORNEO. Sarawak (4th & 5th Div., Baram Dist.): *Anderson 4258: Nielsen* (Mulu Exp.) *792; S 15083, 33027, 35486* — Sabah (mainly Kinabalu): *Chew, Corner & Stainton 142; Clemens 29558,*

32500, 32605, 50721; (Wyatt-Smith & Wood) Kep 80353; Nooteboom 1044; San 33940, 36778, 65314, 76815, 79585 — E. Kalimantan (W. Kutai): *Endert 3996.*

Ecology. A montane species; in ridge forest, mossy forest, mountain forest, dwarfed forest on wind-swept crests; on sandy soil, black or brownish soil; 1200-2100 m alt. Flowers and fruits throughout the year.

Vernacular name. Binarak (Murut lang., Sarawak).

NOTES

1. Fieldnotes. Tree of medium size, sometimes dwarfed. Bark cracked to finely fissured, brown-black to dark brown; inner bark reddish; cambium whitish, sapwood whitish; exudate turning reddish. Fruit orange-yellow, pink, pink-red, or orange-red, aril bright orange. Flowers yellow.

2. At first Sinclair identified most specimens (incl. the type) as *H. polyspherula* var. *montana,* or as *H. montana* Airy Shaw; later on he included *H. montana* as well as the superficially similar *H. xanthina* in his polymorphous concept of *H. glabra.* In the present revision I have kept *H. montana* and *H. xanthina* as distinct species differing from *H. glabra* and from the material here described as a new species. *H. glabra* and *H. xanthina* differ in the flowers, and vegetatively by the much shorter tomentum on the leaf bud, twig-apex and inflorescences; *H. montana* differs by the much smaller globose flowers. *H. endertii* is characterized by fairly large ellipsoid male flowers with an androecium distinctly longer than broad, the pedicels inarticulated at base, very coriaceous leaves, rough-haired leaf buds and inflorescences. On the lower leaf surface there are practically always distinct, large, pale-yellowish coloured hair-scars, well visible when magnified 60 times. *H. endertii* usually has ± rounded leaf tips, as in *H. montana,* but the leaves in the latter usually dry to a blackish colour and are generally smaller and thinner.

3. The type, *Endert 3996,* with male flowers, is from W. Kutai, the only specimen from Kalimantan. The remaining specimens from Sarawak and Sabah somewhat differ in general appearance; their twigs are often less roughly hairy towards the top, the leaves are somewhat more coriaceous with the lateral nerves ascending at a slightly sharper angle from the midrib; all male flowering specimens from Sarawak and Sabah appeared to be in a juvenile state, except the BM duplicate of *Clemens 29558* (Tenompok), of which the identity with the type is evident.

4. The collection *Chew, Corner and Stainton RSNB 142* from Kinabalu somewhat deviates by the relatively large, broad and very coriaceous leaves; it has immature male inflorescences but the lower leaf surface has typical, large, golden or whitish hair scars.

84. Horsfieldia valida (Miq.) Warb. Fig. 1C(84)

Myristica valida Miq., Fl. Ind. Bat. 1 (2), 1 (1858) 67; Suppl. 1 (1860) 156 — *Horsfieldia valida* (Miq.) Warb., Mon. Myrist. (1897) 349; Heyne, Nutt. Pl. (1927) 638. — Type: Sumatra, West Coast, Teijsmann 479 (U; iso: BO, *n.v.*) (sterile, the fruit said to be as large as a goose egg).

Tree 10-15 m. Twigs terete, towards apex 2.5-5 mm diam., at insertion of inflorescences up to 10 mm diam., brown to grey-brown, rather early glabrescent,

tomentum rusty woolly, with hairs 0.4-0.7 mm long; the bark lower down coarsely striate, rather densely set with conspicuous pustulate lenticels; older bark not flaking. Leaves in 2 rows, chartaceous, (ob)ovate-oblong, broadest at or somewhat above the middle, 20-35 × 8-13 cm, base short- to long-attenuate, tip subobtuse to acutish; upper surface glabrous, drying dark- to olivaceous-brown, lower surface drying bright brown, without blackish marks, early glabrescent but midrib rather late glabrescent; midrib above rather broad towards the base, glabrescent, slightly raised; nerves 20-25 pairs, raised above; tertiary venation forming a rather lax network, flat, indistinct or invisible on both surfaces; petioles 7-12 × 3-4.5 mm, glabrescent; leaf bud c. 15-20 × 4 mm, densely ferrugineous-pubescent with hairs c. 0.4-0.7 mm. Inflorescences situated just behind the leaves, ± woolly pubescent with hairs 0.3-0.5 mm, subglabrescent, in ♂: 2 or 3 times ramified, not very many-flowered, 5-6 × 3-4 cm, common peduncle 10-15 mm long; ♀ inflorescences not seen, according to the infructescences c. 5 cm long; bracts not seen, caducous; flowers 4-(or 3-)valved, in loose clusters of 3-6 each, perianth glabrous, pedicel glabrous and inarticulate at the base. Male perianth globose, 2.5-3 × 3-3.5 mm, top and base rounded, pedicel c. 1.5 mm long; perianth at anthesis cleft to c. ⅘, slightly collapsing on drying, valves c. 0.3-0.4 mm thick. Androecium ± depressed globose, 0.8-1.2 × 1.4-6 mm (much smaller than the perianth); in transverse section ± irregularly rounded or faintly 4-angular; anthers 12-14, curved and largely connate with the broad column, at apex free for only c. 0.2 mm; column not or hardly hollowed; androphore rather narrow, 0.1-0.2 mm long. Female flowers not seen (but see under fruits). Fruits 2-9 per infructescence, ellipsoid, top and base ± rounded, c. 8.0(-9.0) × 5.0(-6.0) cm, glabrous, drying brown with surface wrinkled and ± warted, pericarp c. 15 mm thick; stalk c. 5 mm long; perianth persistent under young fruits in *Maradjo 449,* 4-valved, c. 3 mm long.

Distribution. Sumatra (E. and W. Coast; possibly Palembang, see notes), probably W. Borneo (see note 3).

SUMATRA. West Coast: *Maradjo 449; Teijsmann 479* — East Coast: *Lörzing 5896, 15557* — Palembang: *Dumas 1649* (sterile).

BORNEO. West Kalimantan, Mt. Damoes: *H. Hallier 624* (doubtful, see notes).

Ecology. Primary forest, ravine forest; (?200m, see the notes —) 900-1100 m alt. Flowers in March and August, fruits in August.

Vernacular names. Simar mudar-mudar (Timor lang. of Sumatra), Lundang (W. Coast), Pijangoe pĕmatang (Palembang).

NOTES

1. Fieldnotes. Tree erect, branches wide-spreading and arching. Flowers tinged yellow, brown, sweet smelling.

2. The specimen *Dumas 1649,* from Pelambang, is sterile; it deviates from the other specimens (all from 900-1100 alt.) by the shorter tomentum on the leaf bud (hairs only c. 0.3 mm long) and its lower (c. 200 m.) altitude.

3. Deviating specimen from W. Borneo. Hallier 624, with ♂ fl., of Mt. Damoes, is obviously taxonomically closely related to *H. valida,* but it is markedly different in several ways. Apparently it represents a new undescribed species. It keys out

beside *H. valida* because its male perianths are cleft at anthesis to c. ⅘ or deeper, and the pedicels inarticulate at the base. It cannot be *H. fragillima* (pedicels also inarticulate, and keys out next), because that species has the perianths at anthesis cleft at most to ½-way deep, and a saucer-shaped androecium. Our specimen differs from *H. valida* by the much smaller flowers, globose perianth (which is possibly submature) measuring 1.2-1.5 × 1.5-1.6 mm; smaller androecium, 0.5-0.6 × 0.8-1.0 mm with the column at apex broadly hollowed to about ½-way deep, anthers ± completely sessile, ± incurved and concealing the hollow (in *H. valida* the column not or hardly hollow at the apex); there are fewer anthers, 9-11 (in *H. valida* 12-14). It has predominatly 4-valved perianths as in *H. valida* from Sumatra. The ♂ inflorescence is 21 cm long, those of *H. valida* only c. 6 cm. I have not found ♀-flowering or fruiting specimens which match *Hallier 624,* and I have refrained from describing it as a new species. The specimen was determined by Sinclair as *H. fragillima.*

4. Sinclair (p. 150) accepted *H. valida* in a much wider sense. As distribution he included China, most of Borneo, the Philippines, and Celebes. Most of the specimens cited by him for Sumatra have at present been included in *H. valida;* other specimens have been assigned by me to various species. The only one from Borneo (see under note 3, deviating specimen) was included by Sinclair in *H. fragillima.*

5. Warburg (p. 349) remarks that it is vegetatively very alike *H. macrothyrsa,* differing almost only in the fruits which were recorded as unusually large. I disagree as *H. macrothyrsa* differs in many ways, such as the punctate leaves and the much larger male flowers.

85. Horsfieldia borneensis de Wilde, *sp. nov.* Fig. 1C(85)

Ramulorum apices atque gemmae pubescentes pilis ferrugineis 0.2-0.4 mm longis. Folia tenuiter coriacea, subtus praedita punctis atque lineis brevibus sparsis fusco-brunneis. Perianthia mascula 3-valvata, subglobosa ad late obovoidea, 1.3-1.8 × 1.2-1.7 mm, androecio subgloboso sessili, antheris 7-10, sessilibus, pedicello glabro, basi articulato. — Type: Sarawak, *Bojang bin Sitam S 14610* (L iso: K).

Tree 10-30 m. Twigs subterete, not ridged, (1.5-)2-4(-10) mm diam. towards the apex, usually dark grey-brown, sometimes blackish, not conspicuously hollow, early to rather late glabrescent, tomentum rusty, composed of hairs 0.2-0.4 mm, bark lower down faintly finely striate, not distinctly lenticellate, when older finely cracking or not, flaking slightly or not. Leaves in 2 rows, chartaceous to thinly coriaceous, elliptic-oblong to oblong-lanceolate, broadest usually at the middle, 7-18 × 2-6 cm, base (short-) attenuate, top acute to (short-) acuminate; upper surface drying dull olivaceous to (partially) blackish-brown, glabrous, the midrib not or somewhat late glabrescent, lower surface drying pale brown to bright reddish brown or chocolate, glabrescent, tomentum of shortish, densely-branched dendroid hairs, 0.3-0.4 mm (especially on midrib), always with scattered, usually subcircular, larger, blackish dots or marks (cork warts); midrib slightly raised above, early or late glabrescent; nerves 10-16 pairs, slender above, usually flat or sunken (or only close to the midrib slightly raised) or in thinner-leaved specimens slightly raised, glabrous, the lateral arches ± regularly shaped, not very distinct; tertiary venation hardly or not visible on both surfaces; petioles relatively long, 12-25 × 1.5-2.5 mm, early to rather late glabrescent; leaf bud 10-17 × 2-4 mm, densely pubescent with hairs c. 0.3 mm long. Inflorescences behind the leaves,

densely short-woolly pubescent with rusty hairs up to 0.7 mm long, in ♂: fairly large, many-flowered, c. 4 times ramified, (8-)13-20 × (5-)10-18 cm, common peduncle 15-35 mm long; ♀ inflorescences not seen, infructescences up to 13 cm long; bracts elliptic to elliptic-oblong, pubescent as the inflorescences, 1.5-5 mm long, caducous; male flowers in loose clusters of 2-6 each; perianths glabrous, 3-valved, pedicels glabrous, distinctly articulate at base. Male perianth subglobose to broadly ellipsoid or broadly obovoid, 1.3-1.8 × 1.2-1.7 mm, top broadly rounded, base (narrowly) rounded, glabrous; pedicels 1.0-1.5 mm; perianth at anthesis cleft to c. ⅓ (to nearly ½), not collapsing on drying, valves 0.2-0.3 mm thick. Androecium broadly ellipsoid to subglobose, 0.7-1.2 × 0.6-1.3 mm, the top broadly rounded, slightly impressed in the centre, base rounded, in cross-section subcircular; anthers 7-10 (thecae 16-20), almost completely sessile and mutually closely appressed, at apex incurved over the cavity which reaches to c. ⅕-¼ (or less) deep; free apicies ± none; column broad; androphore narrow, c. 0.1 mm or less long. Female flowers not seen; as judged from remnants under very young fruits: perianth c. 2.5 mm long, ovary glabrous. Fruits 1-7 per infructescence, ovoid, somewhat laterally flattened and slightly flanged, top and base rounded, 4.0-6.0 × 3.0-4.5 cm, glabrous, drying brown and often with a glaucous tinge, rather smooth, pericarp (measured dry) 10-15 mm thick; stalk stout, 4-6 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Sabah, E. & NE. Kalimantan.

BORNEO. Sarawak (all Kuching & vicinity, 1st. Div.): *Asah Arb. no. 715; S 12771, 14610, 14759, 25241, 34706* — Sabah (Beaufort Dist.): *San 16838, 31413* — E & NE. Kalimantan (W. Kutai, Balikpapan, Nunukan Isl.): *b.b. 16516, 18180, 29301, 29315, 29373, 34325; Kostermans 7043, 8617, 9782, 9947, 13623; Schut K. 31.*

Ecology. Primary lowland dipterocarp forest; on sandy soils, flat clay soil, sandstone, sandy ridges; 0-200 m alt. Flowers in April, August and September, fruits throughout the year.

NOTES

1. Fieldnotes. Bark of trunk rough, deeply fissured, flaking in squares, usually dark brown or reddish or blackish; strips or flakes up to 5 cm wide, up to 1 cm thick. Living bark 5-10 mm thick, red-brown; sap red; sapwood c. 10 cm, reddish white to pale red, heartwood red-brown. Bark of tree c. 30 cm diam. recorded as deeply fissured, but with a smooth appearance, the strips with rounded edges. Fruits bluish green, turning green-yellow to yellow or reddish, pericarp pink inside, aril orange.

2. Sinclair included most of the specimens of the present new species in *H. wallichii*, a few were determined by him as *H. polyspherula* s.l. or *H.* aff. *ridleyana* (e.g. *Achmat b.b. 34325*). Our present species has in common with *H. wallichii* the characteristic blackish dots on the lower leaf surface, the dull upper leaf surface with largely sunken nerves, and practically similar fruits though they have a persistent perianth in *H. wallichii*. However, *H. wallichii*, which also occurs in Borneo, is generally stouter, has much larger leaves, often with a persistent tomentum. Above all, it differs in the flowers, the general appearance and shape and structure of the androecium, and the pedicel which is inarticulate at the base.

3. On account of the dotted lower leaf surface, *H. borneensis* belongs to the group of species including *H. wallichii* and *H. pulcherrima* whereas the structure of

the androecium links it up with species such as *H. pulcherrima*, *H. flocculosa*, *H. grandis* etc.

4. Variation. A few specimens (especially *San 16838*, *31413*, from Beaufort Dist., Sabah) have relatively thin leaves with the lateral nerves on the upper surface raised; the dry leaves and twigs have a relatively dark blackish colour. These specimens may be mistaken for *H. polyspherula*.

86. Horsfieldia fragillima Airy Shaw Fig. 1C(86); 29

Horsfieldia fragillima Airy Shaw, Kew Bull. 1939, no. 10 (1940) 542 — Type: Sarawak, 4th Division, Mt. Dulit, *Richards 2602* (K; iso: A, SING, *n.v.*).

Tree 10-30 m. Twigs stoutish, terete or faintly angular, 2.5-7(-15) mm diam. towards the apex, early glabrescent, tomentum with hairs c. 0.3 mm, bark of young twigs dark brown, often with conspicuously pale lenticels, bark of older twigs usually paler brown, coarsely striate with a tendency to crack longitudinally and to flake somewhat; lenticels distinct, on older wood inconspicuous. Leaves in 2, or sometimes (partly) in 3 rows, membranous to thinly coriaceous, oblong to oblong-lanceolate, broadest at or somewhat above the middle, 20-45 × 6.5-12 cm, base narrowly rounded to short-attenuate, but blade rather tapering below the middle, base rarely long-attenuate, tip acute or acute-acuminate; upper surface drying olivaceous to brown, lower surface early glabrescent, often with some minute tomentum remaining at and near the base of the midrib; without blackish dots; midrib above raised, towards the base rather broad and flat; nerves 20-30 pairs, above raised, the marginal arches ± indistinct; tertiary venation forming a lax network, faint to nearly invisible above; petioles stout, relatively short and broad and often ± pulvinate, 4-13(-20) × 3-8 mm, glabrous; leaf bud 12-20 × 3-5 mm, densely pubescent with hairs c. 0.3 mm. Inflorescences behind the leaves, rather sparingly set with hairs (0.1-)0.2-0.4 mm, in ♂: large, very many-flowered, 4 or 5 times ramified, 15-30 × 10-20 cm, common peduncle 25-60 mm long; in ♀: 6-13 cm long, stout, rather few-flowered (known from infructescences only); bracts up to 12 × 5 mm, tomentulose, caducous. Flowers 3-(or 4-)valved, glabrous, in ♂ in clusters of 2-6; pedicels glabrous, at base inarticulate. Male perianths globose or sometwhat depressed-globose, 1.4-2.0 × 2.0-2.5 mm, top broadly rounded, base rounded; pedicels 1-1.5(-2.0) mm long; perianth at anthesis cleft nearly to ½-way, valves c. 0.2(-0.3) mm thick. Androecium strongly depressed-globose, almost saucer-shaped, much and broadly depressed in the centre, (sub-)circular in transverse section, 0.5-1.0 × 1.0-1.5 mm; anthers 7-9, almost completely sessile, incurved towards the top, free apices up to 0.1 mm; column broadly saucer-shaped, with a broad apical hollow to about ½-way deep, androphore (if present) narrow, up to 0.1 mm long. Female flowers not seen; perianth 3- or 4-valved, 4-5 × 3-4 mm according to the remnants under the fruit. Fruits up to 8 per infructescence, broadly ellipsoid, rounded at top and base, possibly slightly flattened, c. 6.0-8.0 × 4.0-6.0 cm, glabrous, drying dark brown, the surface wrinkled and usually with small and large pustules or warts, the dry valves 10-20 mm thick; perianth persistent for a long time under the fruit; stalk 2-4 mm long.

Distribution. Borneo (Sarawak, Brunei, Sabah, C. Kalimantan; possibly E. Kalimantan, see note).

BORNEO. Sarawak: *Anderson et al. 15449; Hj. Bakar 4361; Chew Wee-lek CWL. 606; Richards 2602; S 13594, 15137, 16614, 16985, 19535, 23348, 28083, 32141, 34358, 34621, 34968, 35202, 35442,*

Fig. 29 *Horsfieldia fragillima* Airy Shaw
a. leafy twig apex, × ½; *b,* portion of older twig with male inflorescence axilliary to leaf scar, × ½; *c,* mature male flower, lateral view, × 12; *d,* ditto, longitudinally opened, showing androecium, × 12; *e,* androecium, longitudinal section, schematic, × 12; *f,* twig portion with infructescences, fruit mature, note persistent perianth, × ½ — *a-e,* from *S 34358; f,* from *S 16985.*

35756 — Brunei: *BRUN 137* — Sabah: *B.N.B. For. Dept. A 865; SAN A 3449, A.4211, A 4713, 16519, 16648, 27424, 39622, 50063, 66735, 73695, 74417, 75942, 78243, 83457, 83670, 92578* — Central Kalimantan: *Veldkamp 8451* — E. Kalimantan (Balikpapan): *b.b 25571* (doubtful, see notes).

Ecology. Primary lowland dipterocarp forest; hill slopes, flat land, alluvial land, once in seasonal swamp; most commonly recorded from sandy soils, leached clayey loam over sandstone, sandy clay, often along or near streams, riverine forest; 0-400 m alt. Flowers February to May, fruits collected all through the year.

Vernacular name. Kumpung Pango (Iban lang.)

Uses. Fruits recorded as edible, very acid and resinous.

NOTES

1. Fieldnotes. Trunk without buttresses, then often broadly gullied, rounded-fluted, or only with short and rounded buttresses; bark chocolate-brown, reddish-brown, or brown-blackish, recorded either as not furrowed, slightly fissured, mostly with few flakes, or scaly, or peeling into thin flakes. Inner bark c. 3 mm thick, pale pink or reddish to yellowish; sapwood soft, whitish, yellow-pink or pinkish white. Branches somewhat drooping. Flowers yellow. Fruits ramiflorous, large, up to c. 10 × 7 cm. (seed c. 3 × 2 cm), greenish yellow turning rose-pink to red; pericarp thick, to over 2 cm; aril reddish-orange.

2. On the whole a homogeneous species, only a few specimens from Sarawak (1st and 4th Div.) markedly vary, *viz. Bakar 4361* (♂), and *S 13594, 15137, 16985, 34621, 35202* (all in fruit); these deviate from the rest of the specimens by a somewhat stouter habit. The flowers in *Bakar 4361* are somewhat larger, reaching to c. 2.3(-2.5) mm. diam., whereas male perianths of the other specimens from the same localities reach only to c. 2 mm diam.

3. In the sterile state, *H. fragillima* may be confused superficially with *H. laticostata,* as the former may have a similarly broad basal part of the midrib. *H. laticostata* differs by its architecture of the male flowers, much smaller fruits, and different texture and colour of the leaves.

4. H. fragillima seems most related to *H. splendida* and *H. pulcherrima,* which have resembling androecia (though a narrower hollow), and with an inarticulate pedicel-base. The two species differ, however, strongly from *H. fragillima* in general habit, including their markedly hairy lower leaf surface.

5. In *H. fragillima* the leaves in fertile plagiotropic shoots are usually arranged in 2 rows, but in a few specimens they are distinctly in 3 rows. In most Horsfieldias the leaves of plagiotropic shoots are always distichous. The ramiflorous fruiting twigs may reach a width of 25-30 mm.

6. The present species is here accepted largely in the same sense as by Sinclair. I have to exclude *Hallier 624* which may represent a new species; that specimen is discussed in the notes under *H. valida.*

7. The collection *b.b. 25571* from E. Kalimantan is sterile and deviates by the rather coriaceous leaves; no other specimen from E. Kalimantan has been collected.

87. Horsfieldia androphora de Wilde, *sp. nov.* Fig. 1C(87); 30

Ramulorum apices atque gemmae pubescentes pilis 0.3-0.6 mm longis. Folia membranacea, subtus non punctata. Perianthia mascula 3-valvata, globosa, 1.4-2 mm diam., synandrio depresso-globoso, c. 1 mm diam., antheris 7-11, androphoro distincto, gracili, 0.3-0.8 mm longo, pedicellis basi non-articulatis. — Type: Sarawak, *Nooteboom & Chai 01710* (L).

Tree 7-20 m. Twigs terete, 2-4(-5) mm diam. towards apex, rather late glabrescent, tomentum rusty with hairs 0.3-0.6 mm, lower down the bark rather finely but distinctly striate, blackish brown, when older not flaking; lenticels small, not conspicuous. Leaves in two rows, membranous, elliptic to oblong, broadest at about the middle, 9-18 × 3.5-6.5 cm, base attenuate, tip acute-acuminate; upper surface drying dark brown or blackish brown, not minutely pustulate, glabrous, lower surface glabrescent (except midrib), without scattered larger blackish dots; midrib above raised, beneath with some vestigial tomentum or late glabrescent; nerves 9-13 pairs, raised above, the marginal arches on the lower surface not very regularly shaped and not very conspicuous; tertiary venation forming a lax network, distinct or not; petiole 10-12 × 1.5-2 mm, glabrescent; leaf bud 8-12 × 2-3 mm, rusty pubescent with hairs 0.3-0.6 mm. Inflorescences rather densely pubescent with hairs 0.2-0.6 mm, in ♂: rather many-flowered, 3 (or 4) times ramified, 6-14 × 3.5-9 cm, common peduncle 10-20 mm long; ♀-inflorescences (as seen from infructescences) 3-4 cm long; bracts densely short-pubescent, ovate-elliptic, acutish, c. 3 mm long, caducous. Flowers in ♂ in clusters of 2-6 each, 3-valved, glabrous; pedicels glabrous or with a few minute hairs 0.1 mm or less at the very base, at the base inarticulate. Male perianth globose, 1.4-2.0(-2.2) mm diam., base and apex rounded, pedicels (0.5-) 1.0-2.0 mm, slender; perianth at anthesis cleft to a depth of ⅓ to nearly ½-way, valves c. 0.2 mm thick. Synandrium (androecium minus androphore) depressed-globose, somewhat flattened or impressed at apex and/or at base, in transverse section subcircular, (0.6-)0.8-1.0 × (0.8-)1.0-1.3 mm, androphore slender, (0.3-)0.4-0.8 mm long; anthers 7-11 (thecae 14-22), almost completely sessile and interconnate, curved towards the top and concealing the apical hollow, hollow 0.2-0.3 mm deep, occupying c. ⅕-¼ of the broad column. Female flowers not seen. Fruits 2-5 per infructescence, ellipsoid, top subacute to rounded, base rounded or shortly narrowed, 2.4-3.0 × 1.4-2.0 cm, glabrous, drying dark brown, finely tubercled but without lenticels, dry valves 1.5-2 mm thick; stalk c. 2 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Sabah.

BORNEO. Sarawak (Bukit Goram, 4th Div.; Kelabit Highlands, 7th Div.): *Nooteboom & Chai 01710; (Chai) S 35443, 36146* — Sabah (Bukit Kinasaraban); *Sinclair (Kadim & Kapis) 8977.*

Ecology. Montane forest, mossy-forest, wooded sandstone ridges; 800-1200 m alt. Flowers in March and October, fruits in March, June.

Vernacular name. Li-ang (Kelabit lang., Sarawak, 4th Div.).

NOTES

1. Fieldnotes. Bark surface chocolate- to reddish-brown, bark narrowly cracked or longitudinally furrowed and cut into rectangular blocks; latex of bark watery, latex once recorded as more or less colourless (tree in flower), once as blood red (tree in fruit). Twigs chocolate brown, pubescence rusty. Flowers yellow; fruit smooth, not pubescent, orange, aril orange, outer seed coat whitish grey.

Fig. 30. *Horsfieldia androphora* de Wilde.
a, portion of branch with leafy twig and male inflorescence, × ½; *b*, mature male flower, × 12; *c*, ditto, longitudinally opened, showing androecium, × 12; *d*, androecium, longitudinal section, schematic, × 12; *e*, portion of twig with infructescence, fruits mature, aril complete, × ½ — *a-d*, from *Nooteboom & Chai 01710* (Type); *e*, from *Sinclair, Kadim & Kapis 8977*.

2. According to the general architecture of the androecium, this species belongs to the group of *H. grandis*, but it seems closest related to *H. tomentosa* from S. Thailand and Malaya; it has the long-stalked synandrium in common with that species. *H. tomentosa* differs by the generally larger flowers, tomentose lower leaf surface, and smaller fruit which are pubescent or glabrescent. Our present species is mountainous; *H. tomentosa* is exclusively found in the lowland.

H. androphora keys out beside *H. fragillima* (also with inarticulate pedicels), but the latter differs in many characters: general habit, fruit-size, and quite a different saucer-shaped androecium.

3. Three of the known specimens of the present species were yet uncollected when Sinclair revised the genus; his own collection *Sinclair 8977* (fr.) was not recognized as a new species and was included in *H. polyspherula* var. *montana*. In this revision I consider that *H. montana*.

88. Horsfieldia amplomontana de Wilde, *sp. nov.* Fig. 1C(88)

Ramulorum apices atque gemmae tomento conspicuo pilorum 0.3-1.5 mm longorum. Folia 15-35 × 5-11 cm, subtus non punctata. Inflorescentiae masculae magnae, usque ad 20 cm longae. Perianthia mascula 3-vel 4-valvata, subglobosa, 1.5-2 mm diam.; androecio depresso-globoso, 0.6-1.0 × 1.1-1.8 mm, antheris 10-13, sessilibus, androphoro brevi atque angusto, usque ad 0.4 mm longo. Fructus sicci ellipsoidei, 7-8 cm longo, perianthio persistente. — Type: *J. & M.S. Clemens 30536* (L; iso: BM, K).

Tree 10-20 m. Twigs terete, towards the apex 3.5-6(-10) mm diam., grey-brown to dark brown, early to rather late glabrescent, tomentum brown to rusty, composed of hairs 0.3-1.0(-1.5) mm long; bark coarsely striate, lenticels small, not contrasting in colour and inconspicuous, older bark not flaking. Leaves in 2 rows, membranous to chartaceous, elliptic-oblong to oblong-lanceolate, broadest at about the middle, 15-35 × 5-11 cm, base short-attenuate to narrowly rounded, tip acute-acuminate; upper surface glabrous (i.e., glabrescent, except towards the base of the upper midrib in young leaves), drying olivaceous to brown, when dry contrasting or not with the colour of the lower surface, lower surface glabrous (glabrescent), without larger blackish or brown dots, without large pale hair-scars; midrib rather slender above, flattish to moderately raised; nerves 11-12 pairs, above flattish to raised, the submarginal arches not distinct; tertiary venation forming a lax network, ± distinct or not; petioles 8-15 × 2.5-3.5 mm, glabrescent; leaf bud 15-22 × 3-4 mm, densely brown to rusty pubescent with hairs 0.5-1.0(-1.5) mm long. Inflorescences behind the leaves, shaggy-pubescent with rusty hairs c. 0.5 mm, in ♂: 3 or 4 times ramified, many-flowered, 10-21 × 10-16 cm, common peduncle 15-40 mm long, the flowers in ♂ in loose clusters of 5-10; ♀-inflorescences not seen, in fruit c. 7-8 cm long; bracts broadly oval-ellipsoid, 2-7 mm long, finely pubescent, caducous; flowers 3-(or 4-)valved, perianth glabrous, pedicel generally glabrous, at base not articulate or ± articulate in only some flowers (see notes). Male perianth globose or slightly depressed-globose, 1.5-2.0 × 2.0-2.3 mm, top and base (broadly) rounded, glabrous; pedicel 0.8-1.5(-2.0) mm long; perianth at anthesis cleft to ½-⅔, not or only slightly collapsing on drying, valves c. 0.2 mm thick. Androecium depressed-globose, above and beneath broadly rounded, or sagged at base, 0.6-1.0 × 1.1-1-8 mm, in transverse section (sub-) circular; anthers 10-13, almost completely sessile, c. 0.8-1.2 mm long, free apices up to 0.1 mm, curved, concealing the ± 3-radiate apical slit or cavity (0.2-1)0.3-0.5 mm deep; column broad, solid; androphore rather narrow, (0.1)0.2-0.4 mm long,

completely or partly hidden by the anthers. Female perianth not seen (according to persistent perianth under the fruit 3-valved, c. 3 mm long). Fruits 1-3 per infructescence, ellipsoid, top and base rounded, c. 7.0-8.0 × 4.5-5.0 cm, glabrous, drying dark brown, finely to coarsely tubercled, pericarp c. 15 mm thick; stalk c. 3 mm long, at base inarticulate; perianth persisting under the fruit.

Distribution. Borneo (Sabah, Mt. Kinabalu).

BORNEO. Sabah: *Clemens 26971, 30536, 31579; (Mujin) San. 18843.*

Ecology. Primary and secondary forest, ridge forest; on sandstone; 1000-1500 m alt. Flowers November, December, February; fruits in November.

NOTES

1. Fieldnotes. Large tree. Bark grey, fissured; outer bark soft, c. 5 mm thick; inner bark white, soft, c. 5 mm; cambium pale; sapwood white. Exudate from bark stickly. Flowers golden. Ripe fruits orange, aril red.

2. The present species is close to *H. montana* according to the almost similar male flowers, but differs considerably by its stouter habit; stouter twigs, larger leaves, larger male inflorescences, and very much larger fruits with a thick pericarp; in *H. montana* the fruits only measure 20-27 mm in length, and the perianth on these do not persist.

3. The pedicels are generally inarticulate at the base; however, some of the flowers of *San. 18843* seem to have an articulation which may be an artifact caused by drying the specimen.

4. Sinclair identified the specimens of the present new species as *H. valida*, which was in his interpretation very variable and heterogenous, but which is presently regarded as a species confined to Sumatra.

89. Horsfieldia montana Airy Shaw. Fig. 1C(89)

Horsfieldia montana Airy Shaw, Kew Bull. 1939, no. 10 (1940) 542 — Type: Sarawak, Dulit Range, *Richards (Native Collector) 2509* (K).

Tree (3-)7-24 m. Twigs terete or faintly angular, towards the apex 1.5-4(-7) mm diam., grey brown to dark brown, early to rather late glabrescent, tomentum short- to long-shaggy, composed of hairs 0.2-1.0 mm long; bark coarsely striate, lenticels small and inconspicuous or absent, older bark with or without a tendency to flake. Leaves in 2 rows, chartaceous to coriaceous, elliptic to elliptic-oblong, broadest at or slightly above the middle, 4-14 × 2-6 cm, base (short-) attenuate, tip rounded to (sub)acute; upper surface glabrous except the midrib which is late glabrescent towards the base, drying olivaceous-brown to blackish, lower surface glabrous except the very base and midrib (late) glabrescent, drying (chocolate-) brown, not much contrasting with upper surface, without larger blackish marks and without conspicuously large yellowish hair scars; midrib raised above; nerves 6-11 pairs, flattish to raised above, submarginal arches usually not distinct; tertiary venation forming a lax network, faint or invisible on both surfaces; petioles 5-16 × 1.5-2.5 mm, rather late glabrescent; leaf bud 5-10 × 1.5-4 mm with hairs 0.2-1.0 mm

long. Inflorescences situated just behind the leaves, either rather sparsely pubescent with hairs 0.2-0.4 mm, or densely shaggy-pubescent with hairs 0.5-1.0 mm long, in ♂: 3 or 4 times ramified, moderately to many-flowered, 4-12(-16) × 3-10 cm, common peduncle 5-20 mm long, the flowers arranged in loose clusters of 3-10 each; ♀-inflorescences few-flowered, 2-6 cm long; bracts ovate to ellipsoid, pubescent, 2.5-6 mm long, caducous; flowers 3- or 4-valved, perianth glabrous, pedicel glabrous, in ♂ inarticulate at base, in ♀ more or less distinctly articulate (always?; see notes). Male perianth globose to subglobose, (1.2-)1.4-2.0 mm diam., top and base rounded, glabrous; pedicel 1-1.5 mm long; perianth at anthesis cleft to c. ⅓ to nearly ½-way, not or only slightly collapsing on drying, valves (0.2-)0.3 mm thick. Androecium globose or depressed globose, above rounded, at base rounded or ± truncate or sagged, (0.5-)0.6-1.1 × 0.8-1.1 mm, in transverse section subcircular; anthers (8-)9-13 (thecae 18-26) almost completely sessile, 0.8-1.2 mm long, ± curved, free apices up to 0.1 mm; column broad, solid except for a shallow apical cavity or slit 0.1-0.2 mm deep; androphore narrow, 0.3-0.5 mm long, completely clasped and hidden by the anthers thus making the androecium look sessile. Female perianth ellipsoid-obovoid, c. 0.2 × 1.8 mm, glabrous, cleft at anthesis to c. ⅓, valves 3, at sutures c. 0.3 mm thick, pedicel c. 1.5 mm long, glabrous, articulate at base (see notes), ovary ellipsoid, c. 1.5 × 1.3 mm, glabrous, stigma minutely 2-lobed, 0.1-0.2 mm high. Fruits 2-9 per infructescence, ellipsoid, base rounded, ± contracted toward the stalk, top rounded to acutish, 2.0-2.7 × 1.3-1.7 cm, glabrous, drying brown, with or without few small lenticel-like tubercles, pericarp 1.5-2.0 mm thick; stalk 2-4 mm long, at base ± articulate; perianth not persisting.

Distribution. Borneo: Sarawak, Brunei, Sabah.

BORNEO. Sarawak (2nd & 5th Div.): *Richards (Native Collector) 2509; S: 32858, 33025, 33057, 33591* — Brunei: *(Ashton) BRUN 1053* — Sabah (mainly Kinabalu & Pinosok Plateau): *Clemens s.n.* (9. II. 1933), *29558, 32642, 32800, 50505, 50513; Native Coll. 821; Poore 12; SAN 28914, 29239, 32283, 36190, 38257, 38294, 38425, 28957, 49301, 76424, 76458, 76803, 76939; Sinclair, Kadim & Kapis 8987.*

Ecology. Crest forest, kerangas forest on ridges, montane forest, moss forest, *Agathis* forest; on black soil or sandy soil; (800-)1300-2000 m alt. Flowers and fruits throughout the year.

NOTES

1. Fieldnotes. Low or medium-sized tree, without buttresses. Bark (slightly) longitudinally, shallowly fissured, or sometimes falky, chocolate, red-brown, dark brown or dark grey; inner bark pale yellowish, reddish, or brownish, with red watery exudate or not; sapwood pale orange or whitish. Flowers yellow; staminal disc orange; fruits yellow or red. Flowers sweet-scented.

2. Variation. All specimens from Sabah were collected on Kinabalu and its vicinity, and they differ rather markedly from those from Sarawak (2nd and 5th Div.) and from Brunei in the nature of the tomentum on the leaf bud, the apical portion of the twigs, and the inflorescences. The tomentum on the specimens from Brunei and Sarawak (including the type) is short, composed of compact dendroid hairs only c. 0.2(-0.5) mm in length; the Kinabalu specimens have the tomentum composed of hairs 0.5-1.0 mm long, sometimes with even longer emerging hairs, and the tomentum of these specimens render the Kinabalu plants much "rougher" in appearance. This character, however, seems incorrelated with any difference in flower structure, and I have refrained from recognizing it as a different variety.

3. Articulation of pedicels. Whether the pedicel at the base is articulated or not has appeared to be a reliable character for many species, and this holds for both the male and female flowers. In the present species the pedicels of male plants are always inarticulate; in the only female flowering specimen seen, *S. 32858* (Sarawak, 5th Div.) the pedicels look distinctly articulate, as is the case in several collections with immature fruit from Sabah. However, I cannot find other grounds to separate these specimens.

4. Sinclair formerly regarded *H. montana* as a variety of the variable *H. polysspherula,* but in his posthumous publication (1975, p. 36, 42) the taxon was submerged in his polymorphous *H. glabra.*

90. Horsfieldia punctata de Wilde, *sp. nov.* Fig. 1D(90)

Folia subtus dense praedita punctis nigrescentibus, ut in *Horsfieldia punctatifolia* Sinclair, differt foliis minoribus eodem tempore coriaceis, 4-12 cm longis, apice obtusis, fructibus angustioribus, c. 2 cm longis, pericarpio in sicco c. 1.5 mm crasso. Perianthia mascula 3-valvata, globosa, c. 1 mm diam., androecio globoso, ad sectionem transversam circulari, antheris c. 11, sessilibus. — Type: Malaya, *Burgess FRI 9014* (L; iso: K).

Tree 10-25 m. Twigs terete, not ridged, towards the apex 2.5-5(-8) mm diam., dark grey-brown, early to rather late glabrescent, tomentum rusty, with hairs 0.1-0.4 mm long; bark coarsely striate, lower down with a tendency to crack longitudinally and to flake; lenticels ± absent. Leaves in 2 rows, coriaceous, elliptic-oblong to oblong, broadest at about the middle, 4.5-12.0 × 2.0-5.0 cm, base (short-)attenuate, top rounded to subacute; upper surface drying olivaceous-brown, lower surface rufous-brown, glabrous, but midrib remaining pubescent for some time, with densely regularly spaced brown-black dots c. 0.1-0.4 mm diam.; midrib flat or only slightly raised above; nerves 5-12 pairs, thin and flat or only slightly raised above, late glabrescent, the marginal arches indistinct; tertiary venation invisible on both surfaces; petioles 6-12 × 1.5-2.5 mm, late glabrescent; leaf bud 7-13 × 2-3.5 mm, pubescence dense grey-brown to rusty, with hairs 0.1-0.4 mm. Inflorescences densely rusty pubescent, with hairs 0.2-0.3 mm, in ♂: c. twice ramified, not many-flowered, 2-3 × 0.5-1.0 cm, common peduncle c. 10 mm long; ♀ inflorescences only once ramified, 2-3 cm long, glabrescent in fruit; bracts elliptic-oblong, 1-3 mm, pubescent, caducous. Flowers 3-valved, in ♂ in small clusters of 3-5 each, the perianth glabrous, pedicels towards the base minutely pubescent with hairs c. 0.1 m or less long, at base inarticulate. Submature male perianths globose, c. 0.8 × 0.8-1.0 mm; pedicels c. 1.0 mm long, slender; perianth cleft (sutures) to c. (⅔-)¾, valves c. 0.2 mm thick. Androecium depressed-globose to globose, c. 0.4-0.5 × 0.5 mm, top and base broadly rounded, transverse section ± circular; anthers c. 11 (c. 22 thecae, see notes), sessile, towards the top incurved and concealing a shallow, narrow, apical cavity 0.2(-0.3) mm deep; androphore narrow, up to 0.1 mm long. Female flowers not seen. Fruits 2-4 per infructescence, ovoid, top rounded to narrowly rounded, base rounded, glabrous, 2.0-2.3 × 1.7-1.9 cm, drying dark brown, finely granulate, not tubercled; dry valves c. 1.5 mm thick; stalk c. 2 mm long; perianth not persisting.

Distribution. Malaya (Cameron Highlands; Fraser's Hill, Genting, Gunung Bunga Bua).

MALAYA: *FRI (Whitmore) 0306, 4539; (Burgess) 9014.*

Ecology. Lower montane forest on granite, ridge forest; at c. 1000 m. alt. Flowers in March, fruits in November.

NOTES

1. Fieldnotes. Bole straight, with good form, no buttresses. Bark deep-brown to mid-brown, grid-cracked with rather chunky scales or finely fissured with ridges firm, or bark thick and corky, finely longitudinally fissured; outer cut of slash bark brown, inner bark bright red, layered, separated by blade line. Slash wood white to fawn, speckled red; exudate red, blood-like. Fruits greenish-yellow, slightly glaucous.

2. The available flowers are clearly immature, and hence the anthers are difficult to count; possibly there are c. 11 thecae and in reality only 5 or 6 anthers.

3. Obviously closely related to *H. glabra* from S. Sumatra and Java, and to *H. montana, H. punctatifolia* and *H. subalpina. Horsfieldia montana* (from Borneo) is very similar in general habit as well as in the architecture of the male flowers and their fruit-shape, but lacks the characteristic blackish punctation of the leaves; *H. punctatifolia,* a species with a wider distribution in Sumatra, Malaya and Borneo differs in its membranous leaves and larger fruits with a very thick-leathery pericarp; *H. subalpina* is also related, but that species lacks the punctation of the leaves, has larger and less coriaceous leaves, and larger fruits. *H. punctatifolia* has glabrous pedicels, in *H. subalpina* the pedicels are finely puberulous in the lower part, similar as in our present species. Generally *H. glabra* has a much shorter tomentum.

4. Specimens of this species had not yet been collected when Sinclair revised the genus.

91. Horsfieldia costulata (Miq.) Warb. Fig. 1D(91)

Myristica costulata Miq., Ann. Mus. Bot. Ludg.,-Bat, 2, 1 (1865) 48 — *Horsfieldia costulata* (Miq.) Warb., Mon. Myrist. (1897) 350 — Type: Celebes, *de Vriese & Teijsmann s.n.* (L).

H. pachythyrsa Warb., Mon. Myrist. (1897) 618: Koorders, Fl. N.O. Celebes in Med. Lands. Pl. Tuin 19 (1898) 570 ("crassithyrsa") — *M. pachythyrsa* (Warb.) Boerl., Handl. Fl. Ned. Ind. 3, 1 (1900) 86; 87 *("Myristica crassithyrsa") — H. minahassae auct. non* (Warb.) Koord.: Koord., Fl. N.O. Celebes, etc. (1898) 70, p.p. quoad Koorders 18158 — Syntype: *Koorders 18156β* (♂, L. lecto), *18158β* (L.), *18170β* (♀, L).

H. confertiflora Merr., Ph.J. Sc. C. Bot. 13, 5 (1918) 285 — Type: *Ahern's Coll. F.B. 3183* (PNH, *n.v.;* iso: K, P; BO, NY, *n.v.*).

H. megacarpa Merr., Ph. J. Sc. C. Bot. 13, 5 (1918) 286 — Type: *Ramos B.Sc. 16527* (PNH, *n.v.;* iso: BM, K, L, P; BO, NY, SING, US, *n.v.*).

H. villamilii Elmer ex Merr., En. Phil. Fl. Pl. 2 (1923) 182, *nom. nud.*

H. vulcanica Elmer ex Merr., En. Phil. Fl. Pl. 2 (1923) 182, *nom. nud.*

Tree 9-30 m Twigs terete or subterete, not ridged, towards the apex 2.5-5.0 (-10.0) mm diam., greyish to dark brown, early glabrescent, tomentum grey-brown to light rusty, with hairs 0.1(-0.2) mm, lower down the bark finely to coarsely

striate, not flaking, lenticels small, generally inconspicuous. Leaves in 2 rows, membranous, elliptic-oblong to oblong-lanceolate, broadest at or somewhat above the middle, 15-30 × 5-13 cm, base narrowly rounded to attenuate, top acute-acuminate; upper surface drying olivaceous to dark brown, sometimes with whitish marks as in *H. irya;* lower surface early glabrescent, without regularly scattered larger, brown to blackish dots; midrib above flat or slightly raised, early glabrescent, also towards the base; nerves 14-21 pairs, above thin, flattish to usually raised, marginal arches generally indistinct; tertiary venation forming a lax network indistinct or invisible on both surfaces; petioles 7-14 × 2-4 mm; leaf bud slender, 8-14 × 2-2.5 mm, densely grey-brown to rusty pubescent with hairs 0.1(-0.2) mm. Inflorescences situated behind the leaves, rather densely to sparsely pubescent with hairs 0.1-0.2 mm, in ♂: 3 or 4 times ramified, many-flowered, 6-14 × 5-13 cm, common peduncle 10-30 mm long; ♀ inflorescences 2-6 cm long, shortly branched; bracts broadly triangular to elliptic-oblong, 2-4(-5) mm long, densely short-pubescent, caducous. Flowers 3(or 4)-valved, in ♂ in rather dense clusters of 5-10 each, in ♀ fewer, glabrous, pedicels glabrous, at base inarticulate. Male perianth globose to ± depressed-globose, glabrous, 1.5-1.8 × 1.5-2.0 mm; pedicel rather slender, short, 0.4-0.6(-0.7) mm long; perianth at anthesis cleft to c. ½-way, valves c. 0.2 mm thick. Androecium depressed-globose or broadly ovoid or subglobose, 0.5-0.8 × 0.7-1.1 mm, circular in transverse section, anthers 7-10 (thecae 14-20), completely sessile, free apices up to 0.1 mm, incurved over the rather narrow apical cavity which is c. (0.1-) 0.2 mm deep; androphore rather stout, 0.2-0.4 mm long, completely or partly hidden by the anthers. Female perianth subglobose, 2.3-2.5 mm diam., glabrous, cleft at anthesis to a depth of c. ⅓ to nearly ½-way, valves 0.3(-0.4) mm thick; pedicel 0.5-1.0 mm long; ovary ovoid, glabrous, 1.2-1.5 mm diam., stigma minutely 2-lobed, 0.1-0.2 mm. Fruits 1-3 per infructescence, subglobose to broadly ellipsoid or broadly obovoid, top and base broadly rounded, glabrous, c. 3.5-6 × 3-4 cm, surface finely granulate, drying bright brown to blackish brown, dry valves 8-10 mm thick; stalks 2-4 mm long; perianth not persisting.

Distribution. Philippines, Celebes.

PHILIPPINES (Luzon, Pinay, Leyte, Mindanao, Basilan): *BS 16527, 46059, 48080; Elmer 17045; For. B. 3183, 11885, 18893; Jacobs 7604 (Spirit Coll. 5719); PNH 2685, 10995, 42247; Santos 4246; Vidal 1676, 3563; Wenzel 920.*

CELEBES (Minahasa, North, Central): *van Balgooy 3432, 3572; b.b. 17630, 17967, 28217; Koorders 18156β, 18158β; Meijer 9718; de Vogel 2602, 5523, 5626, 6217; de Vriese & Teijsmann s.n.*

Ecology. Mixed rain forest, primary dipterocarp forest; recorded from alluvial soil and volcanic soil, with *Eucalyptus deglupta* dominant; 250-1200 m alt. Flowers and fruits throughout the year, but flowers mainly July to September.

Vernacular names. Kaya Ra (Ra=blood; C. Celebes), Kajura (C. Celebes).

NOTES

1. Fieldnotes. Tree with or without low buttresses, c. 30 × 10 cm. Bark fissured or with longitudinal grooves, often peeling off. Heartwood reddish. Sap from bark first clear, turning red to brown-red. Flowers yellow. Fruits yellow to red, on the larger branches. Jacobs, referring to no. 7604, with the fruits looking as though mature, had remarked: fruits not yet ripe, but aril orange, apparently dehiscent.

2. H. confertiflora (type from Rizal Prov., Luzon) seems a form with rather chartaceous leaves.

3. At first I had intended to describe *Jacobs 7604,* from the Sierra Madre, Luzon, as a separate variety. Its pickled fruits measure c. 7 × 5 cm, and have the pericarp (in spirit) 14-16 mm thick. When dried, however, these fruits attained the size of c. 6 × 4 cm, with the pericarp c. 10 mm thick, linking up with the only slightly smaller fruits of the other material. Its mature-looking (solid) seeds are ellipsoid, c. 4 cm long.

4. H. costulata, incl. the synonyms *H. confertiflora* and *H. megacarpa,* was reduced by Sinclair to *H. valida, sensu lato.*

92. Horsfieldia subalpina Sinclair Fig. 1D(92)

Horsfieldia subalpina Sinclair, Gard. Bull. Sing. 16 (1958) 410; 28 (1975) 131. — Type: Malaya, *Wray 467* (K; iso: L).

Tree 6-30 m. Twigs terete, not ridged, towards the apex 2.5-5(-12) mm diam., dark grey-brown, early glabrescent, tomentum greyish-brown with hairs c. 0.1 mm long or less; bark finely to coarsely striate, lower down not flaking; lenticels usually conspicuous. Leaves in 2 rows, membranous to chartaceous, elliptic-oblong to oblong, broadest at or somewhat above the middle, 15-27 × 5-10 cm, base attenuate, top acute to acute-acuminate, sometimes ± bluntish; upper surface drying olivaceous brown to dark brown, lower surface glabrous, without regularly scattered larger blackish brown dots; midrib above flat or slightly raised; nerves 9-18(-20) pairs, thin and flat or slightly raised above, marginal arches not distinct; tertiary venation forming a lax network not or slightly visible on both surfaces; petioles 5-15 × 2-3 mm, glabrous; leaf bud slender, 12-20 × 2-3 mm, with dense grey-brown to rusty tomentum of hairs c. 0.1 mm long or less. Inflorescences situated behind the leaves, sparsely (subsp. *kinabaluensis*) to rather densely pubescent with hairs c. 0.1 mm, in ♂: rather stout, c. 3 (or 4) times ramified, many-flowered, 5-14 × 3-10 cm, common peduncle (6-)10-30 mm long; ♀ inflorescences 2 (or 3) times ramified, 2-7.0 × 1.5-4 cm, fewer-flowered than in ♂; bracts ellipsoid to oblong, acutish, densely short-pubescent, 2-5 mm long, caducous. Flowers 3- (or 4-)valved, in the ♂ in loose clusters of 2-5 each, perianth glabrous, pedicels glabrous (subsp. *kinabaluensis*) or thinly pubescent entirely or only in the lower half (subsp. *subalpina*), at base inarticulate. Male perianths broad-ellipsoid or subglobose, 1.6-2.3 mm long; pedicels 1.5-2 mm, slender; perianth at anthesis cleft to c. ½-way, valves 0.2(-0.3) mm thick. Androecium globose or broadly ellipsoid, 1.0-1.5 mm long, transverse section circular; anthers 8-12, almost completely sessile, free apices c. 0.1 mm, curving towards the top and concealing the rather narrow, apical cavity, which is 0.3-0.5 mm deep, the column otherwise solid; androphore narrow, 0.2-0.3 mm long, largely hidden by the anthers; see further under the subspecies. Female perianth ellipsoid, 2.0-2.5 × 1.8-2.1 mm, glabrous (subsp. *kinabaluensis*), cleft at anthesis to a depth of c. (⅓-)½, valves c. 0.2(-0.3) mm thick; ovary subglobose to broadly ellipsoid, 1.2-1.5 mm long, glabrous, stigma minutely 2-lobed, c. 0.1 mm high; pedicel c. 1.5 mm long, at base inarticulate. Fruits 2-6 per infructescence, subglobose to broadly ellipsoid to ellipsoid-oblong, 2.5-5 cm long; perianth not persisting; stalk 3-7 mm long; see further under the subspecies.

Distribution. Two subspecies, one in mountainous Malaya, one in the Kinabalu area in Sabah.

NOTE

When working on the group of species with *H. subalpina* and *H. obscura,* there remained a number of fruiting specimens which I could not assign satisfactorily to any of the known taxa. More information on their affinities can only be obtained from such male flowering specimens which have vegetative characters matching closely those of the fruiting material. Such taxa are probably closely related to *H. subalpina* or *H. obscura.* They are enumerated and discussed from A to H under *H. obscura* (p.44).

KEY TO THE SUBSPECIES

1a. Pedicels of male flowers pubescent, at least in the lower half. Male perianth subglobose; androecium subglobose, anthers 9-12. Fruits subglobose to broadly ellipsoid, 2.5-3 cm long ..... **a.** subsp. **subalpina**

b. Pedicels of male flowers glabrous. Male perianth (broadly) ellipsoid; androecium (broadly) ellipsoid, anthers 8 or 9. Fruits ellipsoid, 3-5 cm long ..... **b.** subsp. **kinabaluensis**

a. subsp. **subalpina** Fig. 1D(92)

Inflorescences rather densely pubescent. Male pedicels, at least in the lower half thinly pubescent with hairs c. 0.1 mm. Male perianth subglobose to broadly ellipsoid, 1.6-2.3 × 1.6-2.2 mm; androecium of similar shape, 1.0-1.5 × 1.0-1.2 mm; anthers 9-12. Female flowers not seen. Fruits subglobose to broadly ellipsoid, 2.5-3.0 × 2.0-2.3 cm, top and base rounded, drying brown-blackish, without or with a few tubercles; dry valves 3-4 mm thick.

Distribution. Malaya (Perak, Pahang, Selangor; Fraser's Hill, Genting Highlands).

MALAYA: *Burkill & Holttum 8679; FRI 3884, 4539, 4565; 10972, 16161, 20485; Purseglove P. 4212; SFN 23646; Md Shah MS 1096; Wray (jr) 467.*

Ecology. Mountain forest, 800-1500 m alt. Flowers April, June; fruits Jan, August to December.

Fieldnotes. Bark smooth or with shallow distant fissures; slash reddish, with red sap; slash wood whitish. Flowers yellow, fruits greenish yellow and glaucous, or yellow; aril orange, seed white. The fruits of *Shah MS 1096* were recorded when fresh as measuring 4.5-5 cm long, dry as 3.3-4 cm long; on the Leiden specimen the dry mature fruits reach only c. 3 cm long.

b. subsp. **kinabaluensis** de Wilde, *subsp. nov.*

Gemma tomento e pilis 0.1 mm longis vel minus composito praedita. Differt a subsp. *subalpina* pedicellis florum masculorum glabris, perianthio masculo atque androecio late ellipsoideis, antheris 8 vel 9, fructibus in sicco ellipsoideis, 3-5 cm longis. — Type: Sabah, *Clemens 33136* (L; iso: BM, K; A, B, BO, M, NY, SING, UC, n.v.)

Inflorescences very sparsely pubescent. Male pedicels glabrous. Male perianth (broadly) ellipsoid, 1.7-2.0 × 1.5-1.8 mm; androecium broadly ellipsoid, 1.1-1.2 ×

0.8-1.0 mm; anthers 8 or 9. Female flowers as described under the species. Fruits ellipsoid to broadly ellipsoid, 3.0-5.1 × 1.7-2.5 cm, top ± narrowly rounded, base rounded, drying bright brown to blackish brown, without tubercles; dry valves 4-5 mm thick.

Distribution. Borneo: Sabah (Mt. Kinabalu and vicinity), one doubtful collection from E. Sarawak, see notes.

BORNEO. E. Sarawak (Kalabit Highland, 4th Div.): *Chai S 35461,* doubtful — Sabah (mainly Mt. Kinabalu and Pinosok Plateau) *Clemens 26863, 28305, 28730, 32204, 33136, 50721; Kokawa & Hotta 5477; M.E.D. Poore 0906; Chew & Corner RSNB 4116, 4209, 4530, 7000; San 26793, 28962, 38081, 49691; SFN (Carr) 27351, 27450.*

Ecology. Mountain forest, montane oak forest; clayish soil; 1400-2000 m alt. Flowers and fruits throughout the year.

NOTES

1. Fieldnotes. No buttresses. Bark slightly fissured, reddish brown; inner bark fibrous, whitish turning brown, or soft, and then yellowish; cambium pale yellow; wood white to yellowish, medium hard, heartwood not differentiated. Flowers bright yellow. Fruits yellow-red.

2. Chai S 35461 from Kalabit Highland, c. 1250 m alt., Baram Dist., 4th Div., Sarawak, with immature fruit, possibly belongs here. It deviates by having narrow leaves and small fruits which are albeit immature. The specimens also might belong to *H. xanthina.*

3. Sinclair determined specimens of the present subspecies as *H. glabra* and *H. valida.*

93. Horsfieldia obscura de Wilde, *sp. nov.* Fig. 1D(93)

Tomentum gemmae e pilis 0.1-0.2 mm longis compositum. Folia subtus non praedita punctis nigrescentibus. Androecium ad sectionem transversam circulare. Affinis *Horsfieldia subalpina* Sinclair, differt in anthesi perianthio masculo usque ad ¾ fisso, atque fructibus in sicco majoribus, 5-5.5 cm longis. — Type: E. Kalimantan, *Kostermans 13773* (L; iso: K, P; BO, A, SING, PNH. NY, *n.v.*).

Tree c. 20 m. Twigs terete, not ridged, towards the apex 2-3(-4) mm diam., dark grey-brown, early glabrescent, tomentum greyish-brown to rusty, with hairs 0.1-0.2 mm long; bark finely striate, lower down not flaking; lenticels moderately large, not much contrasting. Leaves in 2 rows, membranous, elliptic-oblong to oblong, broadest at or slightly above the middle, 10-15 × 4-7 cm, base short-attenuate, top shortly acute-acuminate; upper surface drying dark brown, lower surface pale brown to bright brown, glabrous, without scattered larger blackish dots; midrib above flat to slightly raised; nerves 10-13 pairs, very thin and flat above, marginal arches invisible; tertiary venation forming a lax network, very faint or invisible on both surfaces; petioles 11-15 × 1.5-2.5 mm, glabrous; leaf bud slender, 7-10 × 1.5-2 mm, densely grey-brown to rusty pubescent with hairs c. 0.1-0.2 mm. Inflorescences situated behind the leaves, ± sparsely minutely pubescent with hairs c. 0.1 mm, in ♂: 3(or 4) times ramified, rather many-flowered, 7-10 × 5-8 cm, common peduncle (2-)6-12 mm long; ♀ inflorescences c. 3.5 cm long (very stout, as seen in

the infructescences of *S. 36305,* (see notes); bracts caducous, not seen. Flowers 3-(or 4-) valved, in ♂ in clusters of c. 3-5, perianths glabrous, pedicels glabrous or with some minute hairs towards the base, not or sometimes faintly articulate. Male perianth subglobose, 2.0-2.2 × 2.0-2.3 mm; pedicels (1-)1.5-2 mm long, slender; perianth at anthesis cleft ⅔-¾(-⅘), valves 0.2-0.3 mm thick. Androecium subglobose to depressed globose-ovate, at the top narrowly rounded, base broadly rounded, c. 1.0 × 1.0-1.2 mm, transverse section (sub)circular; anthers c. 8, almost completely sessile, the free apices sometimes ± sterile, up to 0.1(-0.2) mm long, curving over and concealing the narrow, shallow, apical cavity, cavity c. 0.1-0.2 mm deep, the rest of the column solid; androphore narrow, up to 0.2 mm long, hidden by the anthers. Female flowers not seen. Fruits (of *S. 36305,* see note 3) 2 or 3 on a short, stout infructescence c. 3.5 cm long; fruits broadly ellipsoid, 5-5.5 × 3.5-4.0 cm, top and base rounded, glabrous, drying dark brown, with a few, small tubercles, dry valves 7-10 mm thick, perianth not persisting.

Distribution. Borneo: E. Kalimantan, possibly Sarawak, see note 3.

BORNEO. E. Kalimantan: *Kostermans 6044, 13773* — Sarawak (7th Div., Kapit): *S 36305* (doubtful).

Ecology. Ridge forest on limestone, coral limestone, yellow sandy soil in lowland dipterocarp forest; 150-730 m. alt. Flowers (E. Kalimantan) in August & November; fruits (Sarawak) in May.

NOTES

1. Fieldnotes. Trunk irregular. Bark red-brown, rough, 5 mm thick, peeling off irregularly in strips. Living bark 10 mm, red to brown-red; sap red. Wood reddish to brown-red. Flowers yellow to dark yellow, smelling of Peru-balsam. Fruits bright orange, seed (aril) red.

2. The two flowering specimens on which the present species is based, *Kostermans 6044* and *13772,* were identified by Sinclair as *Horsfieldia,* probably *glabra.* and *H. glabra* respectively.

3. The specimen *S. 36305* from Kapit, 7th Div. Sarawak is in fruit and agrees vegetatively with the two flowering specimens from E. Kalimantan. However, it being the only one in fruit, collected rather far from the limestone site in E. Kalimantan, provenance of the two male specimens, I am not completely sure whether the two lots are conspecific.

4. Horsfieldia obscura, with male flowers, keys out beside *H. subalpina,* which is accepted for Borneo as the subspecies *kinabaluensis,* restricted to the montane forest in the Kinabalu area. That differs from our present species by the more elongate male perianth, cleft at anthesis to only nearly ½-way, the short-ellipsoid androecium, the more rigid leaves, and the smaller fruits with the pericarp less thick. The present species appears to be closest to the typical *H. subalpina,* from Malaya, which differs in general habit (larger leaves, more distinct lenticels on twigs, larger inflorescences), male flowers cleft to c. ½-way deep, and by smaller fruits.

5. Some deviating specimens which are in fruit, all from Borneo, will most likely key out beside *H. subalpina* and *H. obscura.*

When I was working on the group of species included by Sinclair in his large concept of *H. glabra* and resembling species, there remained some ten sheets of fruiting material which obviously or likely belong to this alliance, but which cannot be satisfactorily matched with any of the species accepted by me. These specimens are enumerated and discussed below (in 8 groups, A to H), because I presume that if male flowers were available, they would key out on or near *H. obscura* or *H. subalpina.* They are not identical with these species, however, because of some features of general habit (twigs and leaves), and because of the characters of the leaves, fruits, and possibly flowers. As a matter of fact, the listed entities below also differ clearly one from the other. They may represent distinct species, but male flowers are needed to affirm this.

A. *Kostermans 7414, 7461.* Both were collected in July 1952 on the peak of Balikpapan (Besikan Balu), E. Kutei, E. Kalimantan, at 700 and 900 m in a mossy forest on sandstone. Vegetatively they come very close to *H. subalpina,* but they strongly deviate by the enormous fruits measuring c. 7-9 × 4.5-5.5 cm when dry, with the pericarp c. 25 mm thick. The bark on the twigs is rather pale and rather smooth, with only small inconspicuous tuberculate lenticels; the nerves are flat above. They were annotated as trees of 12-15 m, bark light brown to blackish, superficially fissured, living bark brown-red, 5-6 mm, wood white with red streaks, fruits orange-brown, aril yellow to orange. These specimens were in 1959 identified by Sinclair as *H. subalpina* and in 1975 as *H. valida.*

B. *Kostermans 4355.* This was collected in Nov. 1950 in E. Borneo, Balikpapan Bay, Muan region near Sg. Riko, at 20 m. alt. on a low ridge with sandy soil with lime. In 1954, in the herbarium at Leiden Sinclair identified it as *H. subalpina;* in 1975 as *H. valida.* It is annotated as a tree, 28 m, with buttresses 6 m high, c. 50 cm over the ground and 30 cm thick; bark rough, fissured, dark brown, containing red sap. Fruit orange. A rather rare tree. The specimens have large, broad, brittle leaves, with the midrib above being rather broad at the base, and therefore, it was perhaps the late Mr. Hildebrand who wrote the identification as probably *H. brachiata* var. *laticostata,* i.e., the present *H. laticostata.* However, the large fruits of c. 5.5 × 4.0 cm, with thick woody pericarp do not agree. The tomentum of the leaf bud is fairly coarse, with hairs c. 0.2 mm long, somewhat reminiscent of that of *H. valida,* a species presently regarded as restricted to Sumatra.

C. *Ashton BRUN 766* and *Murthy & Ashton S. 23348* are probably identical. The first was collected in Brunei in Nov. 1957 in a forest on alluvial soil at the top of a riverbank at c. 150 m altitude and the second, in Sarawak, 4th Div., March 1965, rather inland on the banks of Sg. Baloi, on clay-sand soil. Both have large fruits, long-ellipsoid, c. 6.5 cm long, blackish brown, with a rather woody pericarp 6-8 mm thick (dried), when fresh orange-red and orange-yellow respectively. The leaves dry bright dark brown, the nerves are rather raised above. The twigs of *BRUN 766* dry rather pale and lenticels are inconspicuous. Both specimens have rather large leaves, those of *S. 23348* measuring up to 34 × 12 cm. They somewhat superficially resemble *H. fragillima.*

D. *Tong and Ilias S 32763* from Sarawak, 5th Division (Ulu Sg. Pandarasan, March 1973), a kerengas forest at c. 800 m on sandy soil, has large broadly ellipsoid to subglobose fruits c. 5.5 × 4.5 cm, with apparent thick pericarp, orange when fresh. The fruit resembles somewhat but is smaller than that of species A, B, and C. Vegetatively the specimen agrees best with A in that the leaves are of about similar

size and texture, and the nerves flattish above, and in the bark of the twigs, relatively pale and lenticels inconspicuous. A, however, has very much larger fruits (see above). In Murut language it is called "Bidarak".

E. *Sinclair (& Kadim & Kapis) 9278* at Leiden is a leafy twig with the female inflorescences in an envelope. The field label states that fruits are large oblong, orange outside, 9 × 6 cm, pink inside, the aril orange, the seed 5.5 × 3 cm. It was collected in June 1957, Ranau Dist., Sabah, altitude unrecorded. Sinclair determined it as *H. punctatifolia* but its leaves are devoid of dots, and it does not belong there. These are of moderate size, up to 16 × 5.5 cm, with nerves on the upper surface flat; the bark on the twigs is rather pale.

F. *S. 28083* (*Ilias Pai'e*). I feel strongly that this represents an undescribed species. It was collected in Sarawak, Serian Dist., 1st. Div., South of Kuching, Sept. 1968, in Bukit Selabor, at c. 800 ft. alt., near a stream below Bukit Selabor; a tree, c. 15 m tall, on yellow clay soil, the fruits reddish-green. This locality is in an area with several other locally endemic *Horsfieldia* species. The L-specimen consists of a twig with several large thinly chartaceous leaves c. 33 × 14 cm, which dried light olivaceous-brown; nerves 16-18 pairs, raised above. The leaf bud is densely pubescent with hairs c. 0.2 mm long, the twig is conspicuously lenticellate and there is a ramified infructescence of c. 8 cm long with two large fruits c. 6.5 × 4.5 cm, drying dark brown, with some coarse tubercles, the dry pericarp is c. 10 mm thick. Possibly the alliance of the specimen is with species like *H. fragillima* or, less likely, with *H. grandis* or *H. reticulata* (which have the leaves pubescent beneath), rather than with the *H. subalpina* and the *H. obscura*-group.

G. *Chew Wee-lek CWL 687* from Sarawak, Kuching Dist., from limestone at c. 500 ft. has mature fruits (July 1963) which are ellipsoid, c. 3 × 2 cm, the pericarp c. 2.5 mm thick, finely pale warted-punctate. The leaves are not punctate-dotted beneath. In habit and in fruit, this specimen resembles *H. subalpina* which is a montane species in Malaya and Borneo and I have accepted the Bornean material as subsp. *kinabaluensis* which has larger fruits and which is restricted to Mt. Kinabalu at 1400-1800 m.

H. *SAN 41826 (Mikil)* from Sabah, Tambunan Dist., 6000 ft, and *S 33061 (Tong & Jugah)* from Sarawak, Lawas, 5th Div., at 4500 ft. are probably conspecific. Both are in fruit and do not agree with any known species or with the specimens A to G. The twigs have small but rather conspicuous lenticels, the tomentum of the leaf bud is composed of hairs c. 0.1 mm long, the leaves are of moderate size, up to c. 17 cm long, ± membranous, with the nerves distinctly raised above; the fruits are ellipsoid, 3.5-4 cm long, with the pericarp drying hard, 3-4 mm thick. The specimens are reminiscent of *H. xanthina*, but the nerves in the latter are not raised above, and of *H. androphora* and *H. montana*, but these have the tomentum of the leaf bud composed of remarkably longer hairs, i.e., c. 0.5 mm long, a character which has proved to be constant and valuable in the taxonomy of *Horsfieldia*. Possibly they belong to an undescribed species close to *H. androphora* or *H. montana*.

94. Horsfieldia xanthina Airy Shaw Fig. 1D(94)

Horsfieldia xanthina Airy Shaw, Kew Bull. 1939, no. 10 (1940) 541 (441) — Type: Mt. Dulit, Sarawak, *Richards 1927* (K; iso: A, SING, *n.v.*).

Tree 10-30 m. Twigs terete or faintly angular at apex, 2.5-6(-16) mm diam.,

drying dark brown, early glabrescent tomentum of hairs c. 0.1 mm, lower down bark coarsely striate and with a tendency to flake, lenticels conspicuous or not. Leaves in 2 rows, coriaceous, elliptic to oblong-lanceolate, broadest at about the middle, 8-35 × 3.5-13 cm, base attenuate to short-rounded, top subacute to acute-acuminate; upper surface drying olivaceous-brown to (dark) brown, usually with rather distinct hair-scars, lower surface drying usually with a reddish-brown tinge, without blackish dots, early glabrescent; midrib above slightly raised, glabrous; nerves 8-20 pairs, above slender, flat or slightly raised, glabrous, the lateral arches very indistinct above; tertiary venation forming a lax network, indistinct or invisible on both surfaces; petioles 7-12 × 2.5-3 mm, early glabrescent; leaf bud 8-13 × 2-3.5 mm, covered by hairs 0.1(-0.2) mm long. Inflorescences behind the leaves, rather densely pubescent by hairs c. 0.1 mm, in ♂: rather short and robust, (2-)4-20 cm long, (2 or) 3 times ramified, not many-flowered, common peduncle 5-8 or 15-20 mm (subsp. *macrophylla*) long, the flowers in loose clusters of 3-5(-8), reflexed or not; ♀ inflorescences (as seen in infructescences with young fruits) 1-1.5 or 5-7 (subsp. *macrophylla*) cm long, few-flowered; bracts not seen, caducous; flowers 3- or 4-valved, perianth glabrous, pedicels glabrescent or with a little tomentum of hairs, c. 0.1 mm towards the base, at base inarticulate. Male perianth broadly ellipsoid to ovoid-subglobose, 2.5-2.8 mm long, top rounded, base shortly rounded and somewhat tapering into the pedicel; pedicel thickish, somewhat tapering or not, straight or ± curved (flowers reflexed), 1-2.5 mm long; perianth at anthesis cleft to c. ½ (-⅔), slightly wrinkled but not collapsing on drying, valves 0.4-0.8(-1.0) mm thick. Androecium somewhat laterally flattened, ± broadly obovoid in outline, 1.0-1.3 mm long; anthers 5-8, erect, 0.9-1.1 mm long, largely sessile with free apices erect, 0.1-0.3 mm; column rather broad, solid, at apex shallowly hollowed (0.1-0.3 mm); androphore ± tapering, rather broad, (0.1-)0.2-0.3 mm long. Female inflorescences and flowers known only in subsp. *macrophylla;* ovary glabrous. Fruits 2-6 per infructescence, when immature (subsp. *xanthina*) ellipsoid-obovoid or broadly ovoid, glabrous; stalk stout, c. 3 mm long; perianth not persisting.

Distribution. Borneo: Sarawak, Sabah; two subspecies, both montane.

KEY TO THE SUBSPECIES

1a. Twigs moderate, towards the apex 2.5-4.5(-8) mm diam. Leaf blades 8-18 × 3.5-7 cm. Male inflorescences 2-5 cm long, the flowers often ± reflexed; anthers 5 or 6. ..... **a.** subsp. **xanthina**

b. Twigs stout, towards apex 3.5-6(-16) mm diam. Leaf blades 22-35 × 7-13 cm. Male inflorescences 10-20 cm, flowers erect, anthers 7 or 8 ..... **b.** subsp. **macrophylla**

a. subsp. **xanthina** Fig. 1D(94)

Tree 10-17 m. Twigs towards apex 2.5-4.5(-8) mm diam., bark with a tendency of flaking. Leaf blades 8-18 × 3.5-7 cm. Male inflorescences (2-)4-5 × 2-3.5 cm, the rhachis at base 2-3 mm diam.; flowers often ± reflexed. Male perianth subglobose or broadly ellipsoid, c. 2.5 × 2.2-2.5 mm, cleft at anthesis to c. ½-⅔; pedicels 2-2.5 mm long. Androecium slightly laterally compressed, 1.0-1.2 × 0.8-1.0 × 0.4-0.5 mm, anhers 5 or 6. Female flowers not seen. Fruits immature, ellipsoid-obvoid, c. 1.4 × 1.2 cm.

Distribution. Sarawak.

BORNEO. Sarawak (Mt. Dulit, Baram Dist.) *Richards 1927; S 19396, 30821, 34876.*

Ecology. Kerangas forest, heath forest, submontane forest; on sandy soils, yellow sandy soil, sandstone, or "on higher flanks of limestone mountain among huge limestone boulders with vegetation and organic layer entwined between boulders"; 800-1150m. Flowers in August, September; young fruits in September.

Vernacular names. Kumpang; Getah merah (Sarawak); Buah itek (Kenyah, Sarawak).

NOTES

1. Fieldnotes. Flowers yellow. Fruit glaucous green or green and shiny.

2. Male flowers known only from the type, and *S 34876.* A third specimen, *S 30821,* bears immature fruits. A fourth, *S 19396* is annotated as having fruits, but I have not seen these in the L-duplicate; this latter specimen slightly deviates by the somewhat longer hairs on the leaf buds, being c. 0.2 mm long rather than c. 0.1 mm or less as in the other specimens.

3. H. xanthina was included in *H. glabra* by Sinclair (l.c. p. 36, 41, 48). I accept it as a separate species, characterized by the flaky bark of the twigs, the coriaceous and often ± reddish-brown tinged leaves, and the coriaceous rather large male flowers with a typical androecium of only 5 or 6 anthers and a rather marked androphore. Possibly the species is confined to Kerangas at rather high altitudes.
I agree with Airy Shaw that the species is close to *H. majuscula,* from Malaya and Sumatra, which differs by the non-flaking bark of twigs, membranous leaves, 7-9 anthers, the pedicel articulate at base, and possibly by larger fruits.

b. subsp. **macrophylla** de Wilde, *subsp. nov.*

Perianthium masculinum crasse coriaceum; androecium quam latum longius. A subspec. xanthina ramulis robustioribus apicem versus 3.5-6(-16) mm diam., foliis maioribus 22-35 cm longis, 7-13 cm latis, antherisque 7 vel 8. — Type: Mt. Kinabalu, *J. & M.S. Clemens 50050* (K; iso BM, L).

Tree 25-30 m. Twigs towards the apex 3.5-6(-16) mm diam.; bark not flaking. Leaf blades 25-35 × 7-13 cm. Male inflorescences 10-20 × 7-11 cm, the rachis at base 3.5-4.5(-5.0) mm diam.; flowers erect. Male perianth broadly ellipsoid, 2.6-2.8 × 2.5-2.7 mm; valves 3, splitting the bud to nearly ½-way; pedicel 1-1.5 mm long. Androecium c. 1.3 × 0.8 mm, subtriquetrous in transverse section; anthers 7 or 8. Female inflorescences 5-8 cm long, once or twice ramified. Female perianth ovoid-ellipsoid, 4.0-4.5 × 3.0-3.5 mm, valves 3, splitting the bud to nearly ½-way, valves c. 0.8(-1.0) mm thick. Pedicel 1.5-2.0 mm, glabrous or with some minute hairs towards the base. Ovary ovoid, c. 2.2 × 2.0 mm, glabrous, stigma broadly 2-lipped, c. 0.3 × 1.0 mm. Fruits immature, broadly ovoid, c. 1 cm long.

Distribution. E. Sarawak, Sabah (Mt. Kinabalu).

BORNEO. Sarawak (East; Baram Dist., Kapit Dist.): *Anderson & Ilias bin Paie S 28523; Chai S 35442* — Sabah (Mt. Kinabalu): *J. & M.S. Clemens 50050.*

Ecology. Mountain forest, ridge forest, at 1100-1300 m; on igneous derived (andesitic) soils. Flowers July and November; young fruits in November.

Vernacular names. Kumpang lusoh, Kumpang parawan (Baram Dist.).

NOTES

1. Fieldnotes. Poorly developed low buttresses, once recorded; bark brown and grey, fissures boat-shaped; exudate light red, watery. Flowers yellow or orange; ovary pale purple. Young fruits green.

2. The type, with male flowers, was determined by Sinclair as *H. valida,* a species presently regarded as restricted to Sumatra; the other specimens of the present new subspecies were not yet collected in Sinclair's time.

3. Fruit of the iso-type, in BM, is annotated as being in the fruit collection; I have not seen them and doubt that they belong to the same species because the mounted specimen is male.

95. Horsfieldia majuscula (King) Warb. Fig. 1D(95)

Myristica majuscula King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 310, pl. 143 — *Horsfieldia majuscula* (King) Warb., Mon. Myrist. (1897) 315; Gamble, Mat. Fl. Mal. Penins. 5, 23 (1912) 215; Ridley, FL. Mal. Pen. 3 (1924) 57 — Lectotype: Malaya, *King's Coll. 5039* (BM, L; see notes).

Horsfieldia bartlettii Merr., New Sumatran Plants IV, Papers Mich. Acad. Sc. Arts & Letters 24, 1 for 1938 (1939) 71 — Type: Sumatra, *Rahmat si Boeea 8772* (A, *n.v.;* iso:L).

Tree 6-25 m. Twigs terete, towards the top 2.5-5(-8) mm diam., grey-brown, early glabrescent, tomentum greyish brown, of hairs c. 0.1(-0.2) mm; bark lower down rather coarsely longitudinally striate, with smallish, sometimes rather inconspicuous, lenticels, older bark not flaking. Leaves in 2 rows, membranous to thinly chartaceous, elliptic-oblong to oblong, broadest usually at the middle, 15-27 × 5.5-9.5 cm, base attenuate, top acute-acuminate; upper surface glabrous, drying dull olivaceous brown, the midrib glabrous, lower surface drying brown, not very conspicuously contrasting in colour of the upper, without blackish larger dots, early glabrescent including midrib; midrib above slender, glabrous, raised; nerves 11-19 pairs, raised above; tertiary venation forming a lax network generally indistinct or invisible on both surfaces; petioles 10-20 × 2-2.5 mm, early glabrescent; leaf bud slender, 10-15 × 2-3 mm, pubescent with grey brown hairs c. 0.1(-0.2) mm. Inflorescences not very densely pubescent with stellate hairs c. 0.1 mm long, in ♂: 2 or 3 times ramified, not very many-flowered, c. 8 × 4-5 cm, common peduncle 10-15 mm, the flowers in clusters of 2-5; ♀-inflorescences 2-5 cm long; rather few-flowered, twice ramified; bracts ovate-oblong, c. 4 × 2 mm, densely pubescent with hairs c. 0.2 mm, caducous; flowers 3-(or 4-)valved, perianth glabrous, pedicel glabrous or sparsely pubescent, immature ones with hairs c. 0.1 mm, at base articulate. Male perianth broadly ellipsoid or obovoid, (2.0-)2.2-3 × (1.8-)2.2-2.5 mm, top rounded, base short-attenuate, pedicel 2-3 mm long, slightly tapering; perianth at anthesis cleft to ⅓ to nearly ½-way, not or slightly collapsing on drying, valves thick, c. 0.3 mm, towards the base to c. 0.8(-1.0; mm thick. Androecium (incl. the 0.2-0.5-mm long androphore) ellipsoid to ellipsoid-oblong, (1.4-) 1.7-2.0 × 0.8-1.0 mm, in transverse section subtriangular to subelliptic; anthers 7-9 (i.e., 14-18 thecae), slightly curved, (1.2) 1.3-1.8 mm long, free at apex for c. ⅓-¼, i.e., c.

(0.2-)0.3-0.5 mm, androphore rather broad, shortly tapering, 0.2-0.5 mm long. Female perianth broadly obovoid, c. 2.5 × 2.5 mm, glabrous, cleft at anthesis to c. ⅓, valves at base c. 0.6-0.8 mm thick, pedicels 2-3 mm long, glabrous, articulated, ovary ellipsoid, 1.8-2.0 × 1.3-1.5 mm, glabrous, stigma 2-lipped, c. 0.3 mm high. Fruits 1-5 per infructescence, ellipsoid, top and base rounded, 4.3-6.5 × 3.0-4.5 cm, glabrous, drying rusty-brown, finely granulate but not or inconspicuously warted or lenticellate, pericarp 4-11 mm thick; stalk 2-7 mm long; perianth not persisting.

Distribution. Malaya (Perak, Pahang, Kelantan), Sumatra (W. & E. Coast, Palembang).

MALAYA: *FRI 2885, 4506, 4767, 5656, 10835, 16511; Kadim & Noor KN. 610; KEP 104863; King's Coll. 5059; Scortechini 837.*

SUMATRA. West Coast: *Beccari 791; Meijer 6776* — East Coast: *Lörzing 15557; Rahmat si Boeea 8772, 9331* — Palembang: *van Steenis 3384.*

Ecology. Dry-land forest and freshwater swamp-forest of lowland and montane areas; rocky stream banks, river valleys; up to 1000 m alt. Flowers and fruits throughout the year.

Vernacular name. Kajoe andorodong (E. Coast Sumatra, Asahan).

NOTES

1. Fieldnotes. Trees without buttresses; bark distantly shallowly fissured or forming shallow, rectangular flakes. Slash wood whitish, red-flecked. Fruits (*Meijer 6776,* W. Sumatra) up to 5 per infructescence, when fresh up to 7 × 6 cm, pericarp c. 1.5 cm thick. Fruits yellow to bright red, aril orange. Flowers yellow.

2. H. majuscula has formerly been mixed up with what is in my present treatment *H. polyspherula* var. *sumatrana* (in Sinclair's as *H. brachiata* var. *sumatrana*) and the present new variety *H. polyspherula* var. *maxima. Horsfieldia polyspherula* var. *sumatrana* differs by the usually coarser hairs on the leaf bud, more contrasting colour of the two surfaces of dry leaves, smaller globose male perianths, an essentially different androecium, and smaller fruits, up to 35 mm long. The var. *maxima,* only known from Borneo, differs by the same characters, but has fruits of similar size as *H. majuscula,* with the pericarp up to c. 15 mm thick.

3. Lectotypification. Sinclair (1975, p. 16-18) placed *H. majuscula* entirely (i.e., including the whole of King's syntype) in the synonymy of his *H. brachiata* var. *sumatrana,* a taxon which in this treatment is accepted in a much more restricted sense as a variety of *H. polyspherula.* However, Sinclair did comment on the heterogeneity of King's syntypes.

King (p. 311) cites 7 syntype-specimens. These certainly belong to more than one species. Although King placed his *Myristica majuscula* in the section *Irya* on the characters of male flowers, and although within this section it is keyed out mainly on characters of the male flowers and the male inflorescences, I have chosen *King's Collector 5059* (in L, iso K), a fruiting specimen, as the lectotype for the following reasons.

My analysis of King's syntypes together with some information from the rest of the protologue is:

King's Coll. 5059: fine fruiting collection, seen in K and L; lectotype; identical with the present circumscription of *H. majuscula.*

King's Coll. 6004: male flowering, seen in BM and L; this is a somewhat aberrant specimen, because of its relatively large flowers, to be treated under *H. polyspherula* var. *sumatrana,* see there.

King's Coll. 7965: in submature fruit, seen in BM, K; this is possibly the present *H. majuscula.*

King's Coll. 10413: submature fruit, seen in K, P. This is possibly *H. polyspherula* var. *sumatrana.*

Wray 2218, 2705: specimens in CAL, SING, not seen; according to Sinclair both collections link up with *H. polyspherula* var. *sumatrana* in the restricted sense.

(?) Hullet (590), from Singapore: fruiting, in herb. K; the fruits are small, identical with my present *H. polyspherula* var. sumatrana.

However, the male plant figured on King's plate 143 apparently belongs to true *H. majuscula* as presently accepted by me, according to the smallish few-flowered male inflorescence, and the longer-than-broad shape of the perianth and androecium. Possibly it is drawn from *Scortechini 837,* a male collection, which was certainly in King's hands, but which is not cited among the syntype specimens of *Horsfieldia majuscula.* Thus, most likely, this collection served for the drawing, whereas King's description of the male flowers (perianth globose with rather depressed androecium) apparently was taken from *King's collector 6004,* a somewhat abberrant specimen presently treated in the notes under *H. polyspherula* var. *sumatrana.*

From the above it will be obvious that the present lectotypification prevents the proposal of a new name, and the name *H. majuscula* is retained.

4. The specimen *van Steenis 3384* (Palembang Province in Sumatra, near Lake Ranau at c. 600 m) has immature male flowers; the perianth is slightly less coriaceous and only c. 0.4 mm thick, the androphore short, only 0.1-0.2 mm, and the pedicels are sparsely pubescent towards the base. I suppose that these slight differences, if compared with the other specimens, can be attributed to the juvenile stage of the flowers.

96. Horsfieldia coriacea de Wilde, *sp. nov.* Fig. 1D(96)

Habitu atque fructibus *Horsfieldiae costulatae* (Miq.) Warb. similis, differt floribus masculis perianthio crasse coriaceo, androecio elongato, antheris 5 vel 6. — Type: *b.b. Cel. III-27* (L).

Tree 8-25 m. Twigs terete, towards the apex 2.5-4(-10) mm diam., dark grey-brown, early glabrescent, tomentum greyish brown, of hairs c. 0.1 mm; bark lower down finely striate, older bark not flaking, lenticels conspicuous or not. Leaves in 2

rows, membranous to thinly chartaceous, elliptic-oblong to oblong, broadest at or slightly above the middle, 14-27 × 5-10 cm, base attenuate, top acute-acuminate; upper surface glabrous, drying olivaceous brown to blackish brown, the midrib glabrous but towards the base in younger leaves finely pubescent, lower surface glabrous, without larger, brown or blackish dots; midrib moderately raised above; nerves 13-18 pairs, raised above, marginal arches not distinct; tertiary venation forming a lax network little or not visible on both surfaces; petioles 12-16 × 2.5-3.5 mm, early glabrescent; leaf bud slender, 12-17 × 2-3 mm, densely grey-brown to rusty pubescent with hairs c. 0.1 mm long. Inflorescences situated behind the leaves, rather sparsely pubescent with hairs c. 0.1 mm; in ♂: 2 or 3 times ramified, not many-flowered, 4-10 × 3-5 cm, common peduncle 10-20 mm long, the flowers in loose clusters of 3-5; ♀-inflorescences (according to infructescences) c. 2-5 cm long; bracts not seen, caducous. Flowers 3- or 4-valved, perianth glabrous, pedicel glabrous, at base inarticulate. Male perianth subglobose to broadly ovoid, 2.0-2.5 × 2.0-2.3 mm, top shortly rounded to subacute, base rounded; pedicel 1.5-2.0 mm long; perianth at anthesis cleft to c. ½-⅔, not or only slightly collapsing on drying, valves 0.4-0.5 mm thick, coriaceous. Androecium subellipsoid, c. 1.5-1.6 × 0.8-0.9 mm, in transverse section ± blunt-triangular; anthers 5 or 6, at the base curved, and towards the top erect or somewhat curved, c. 1.6 mm long, largely sessile, free apices 0.1-0.2(-0.3) mm, apical cavity narrow, 0.2-0.3(-0.5) mm deep, androphore narrow, 0.1-0.2 mm long, hidden by the anthers. Female flowers not seen. Fruits 1-5 per infructescence, ellipsoid, top and base rounded, 4.0-4.2 × 2.5-3.2 cm, glabrous, drying rust-brown, finely granulate and without or with a few tubercles or lenticels, pericarp rather coriaceous, 3.5-8 mm thick; stalk 2-4 mm long; perianth not persisting.

Distribution. Endemic in C. Celebes.

CELEBES. Central: *van Balgooy 3881, 4000;* b.b. *Cel/II-153, Cel./II-313, Cel./III-27; Johanson, Nybom, Riebe 133; Meijer 11248; 11278.*

Ecology. Primary and disturbed forest (with *Imperata, Gleichenia, Melastoma* and scattered *Castanopsis*) on ultrabasic soil; 100-700 m alt.. Flowers in March and November, fruits in April and July.

Vernacular name. Peroso laki (C. Celebes)

NOTES

1. Fieldnotes. Bark and leaves with aromatic scent. Branches horizontal. Cauliflorous; flowers yellow with strong scent. Perianth fleshy. Ripe fruits orange.

2. Around the insertion of the androecium in most flowers there are a few minute wart-like appendages *or* 'disc-lobes', c. 0.1 mm high.

3. Vegetatively or in fruit, the present species very much resembles *H. costulata*, which has a much larger distribution in Celebes and the Philippines. However, the latter differs generally by the thinner membranous leaves, with the upper midrib including the base glabrous, by the lateral nerves usually forming a greater angle with the midrib, less conspicuous lenticels on the twigs, leaves drying generally more olivaceous; also, the fruits are generally larger with a thicker pericarp,

8-10(-15) mm thick. Furthermore, the male flowers are quite different, in *H. costulata* arranged in rather dense clusters of 5-10 together.

4. As can be seen from the general key, the present species seems closely related to *H. xanthina* (Borneo) and *H. majuscula* (Sumatra, Malaya), both species having also a leathery perianth and an elongate androecium, the last-named species also having similar fruits. In both *H. xanthina* and *H. majuscula,* however, the androphore is broader and tapered and unhidden by the anthers; in *H. majuscula* the pedicels are articulate at the base.

5. Sinclair included specimens of the present new species in the broad concept of *H. valida.*

97. Horsfieldia penangiana Sinclair Fig. 1D(97)

Horsfieldia penangiana Sinclair, Gard. Bull. Sing. 16 (1958) 408, fig. 42; 28 (1975) 94 — Type: Penang, *Curtis 2406* (SING, *n.v.;* iso: BM, K).

Myristica griffithii auct. non Hook. f.: King, Ann. Roy. Bot. Gard. Calc. 3 (1891) 31, p.p., quoad *Curtis 2406, 2458 — Gymnacranthera farquhariana* var. *griffithii auct. non* (Hook. f.) Warb.: Gamble, Mat. Fl. Mal. Penins. 5, 23 (1912) 226, p.p.

Tree 4-25m. Twigs terete, in the apical portion 1.5-2.0(-4.0) mm diam., grey-brown to brown, early glabrescent, tomentum grey-brown, composed of hairs up to c. 0.1 mm long, twigs lower down with the bark finely striate, not flaking, lenticels small, conspicuous or not. Leaves in 2 rows, membranous to thinly coriaceous, elliptic-oblong to oblong, broadest at about middle, 5-12 × 2-4 cm, base attenuate, top acute-acuminate or rounded (*S 23689,* see notes); upper surface drying olivaceous brown to blackish brown, lower surface early glabrescent, provided with regularly scattered dark brown to (rarely) pale brown dots (lens, × 30); midrib above flattish to raised; nerves 8-11 pairs, above thin, flat, inconspicuous or invisible, marginal arches indistinct or invisible; tertiary venation forming a lax network indistinct or invisible; petioles 8-13 × 1-2 mm, early glabrescent; leaf bud slender, 6-9 × 1-1.5 mm, densely greyish-brown pubescent with hairs up to c. 0.1 mm. Inflorescences with rather sparse tomentum, hairs c. 0.1 mm, in ♂: 3 or 4 times ramified, moderately- to many- flowered, 2-7 × 1.5-4.5 cm; common peduncle 2-20 mm long; bracts ovate-oblong, short-pubescent, 1.5-2.5 mm long, caducous; ♀ inflorescences: 2-5 cm long as judged from the infructescences. Flowers 2-, 3- or 4-valved (see notes), in ♂; in loose clusters of 2-5 together, glabrous, pedicel glabrous, at base ± articulate or not (see notes). Male perianth rather variable in shape (see notes), subglobose to ellipsoid, ± circular to faintly triangular in transverse section, 1.2-1.8 × 1.0-1.5 mm, top rounded, base rounded; pedicel c. 0.8-1.5(-2.0) mm, slender, not tapering; perianth at anthesis cleft to c. ⅓ to nearly ½-way, valves c. 0.2 mm thick. Androecium variable, either broadly ellipsoid or globose or depressed-globose (see notes), c. 0.6-0.7 × 1.0 mm, or perianth ellipsoid, 0.7-1.5 × 0.6-1.2 mm, in transverse section (sub)circular; anthers 5-9(-10), almost completely sessile, free apices (0-)0.1-0.2(-0.3) mm, erect or slightly incurved, column broad with narrow shallow hollow at apex, androphore up to 0.1 mm long. Female perianth not seen. Fruits 2-6 per infructescence, ovoid-ellipsoid, 1.1-2.0 × 0.9-1.5 cm, top (narrowly) rounded, based rounded, glabrous, without lenticel-like tubercles, drying brown with finely wrinkled or granulate structure; dry valves c. 1.5 mm thick; stalks 3-4 mm long, at base articulate; perianth not persisting.

Distribution. Malaya, Sumatra, Borneo (Sarawak, E. Kalimantan).

MALAYA. Penang Isl: *Curtis 2406* (from 2 localities, see notes) — Pahang: *Kadim & Noor KN 558; Shab & Noor MS 1984* — Selangor: *Whitmore FRI 0948.*

SUMATRA. Tapanuli: *b.b. 26117* — West: Mt. Sago, *Maradjo 435* — Jambi Prov.: *Roos & Franken 1471.*

BORNEO. Sarawak (3rd Div.): *S 23689* — E. Kalimantan (W. Kutai): *b.b. 16872, 16878.*

Ecology. Primary dryland rainforest, ridge-top forest, mountainous forest; 0-1300 m alt. Flowers in June, fruits in August.

NOTES

1. Fieldnotes. The apparently mature fruits of *S. 23689* (Sarawak) have been recorded as dark green, near mature male flower buds as green.

2. Variation. Rather much variation is shown among the few specimens presently considered under *H. penangiana,* especially in leaf shape and texture, and in the shape of the male perianth and the androecium. The leaves of specimens from Malaya and Sumatra have the tip acute-acuminate, as normally in *Horsfieldia;* the leaf tip of the specimens from Borneo (*S. 23689,* and *b.b. 16872, 16878*) are blunt or broadly rounded. The leaves of *Maradjo 453,* from Mt. Sago, West Sumatra, at c. 1000 m, are conspicuously coriaceous.

The flowers, including those of the Penang-specimens, are generally 3-(or 4-) valved. Sinclair quotes from Penang Isl. two specimens, *viz. Curtis 2458* (not seen) and *2406,* the type; of *Curtis 2406* I have not seen the holotype in SING, but I have examined two isotypes, in BM and K. Both these apparently belong to the same species, but according to the labels, and from the details of the flowers when dissected, they rather differ. The BM collection of Curtis *2406* is annotated as from between the Coolie Lines and Experimental Nursery: the male perianths in bud are rather ellipsoid, c. 1.8 × 1.5 mm, the androecium is depressed ellipsoid, c. 1.2-1.5 × 1.2 mm, and bears c. 7(-10) anthers. The K collection of *Curtis 2406* consists of two specimens, one from between the Coolie Lines and the Experimental Station, the other from Government Hill; the latter has the male perianths globose, c. 1.4 mm diam., with the mature androecium depressed globose, c. 0.6-0.7 × 1.0 mm, bearing c. 9 anthers.

The flowers of *Roos & Franken 1471* from Djambi, Sumatra, deviate from the type and West-Malesian *Horsfieldias,* by being all 2-valved. All flowers are rather immature, but apart from the remarkable deviation, the specimen obviously belongs to present species; there are only 5 or 6 anthers.

Pedicels are usually inarticulate at the base, but among the male flowers in one inflorescence quite often some more or less (not completely) articulate pedicels can be found.

3. Fruits are only known from one collection from Borneo, *S 23689,* a specimen which deviates by its blunt leaves; its fruit-stalks are distinctly articulate at the base. The pedicels of the male flowers in all specimens are either inarticulate or only partly articulate at the base.

4. Horsfieldia penangiana is recognized by its slender twigs with smallish punctate leaves, the very short tomentum of leaf buds and inflorescences, the usually ellipsoid male perianth, and ellipsoid androecium which is (sub)circular in transverse section. In general habit it resembles *Gymnacranthera eugeniifolia*. Sterile specimens may also recall *H. ridleyana*. Taxonomically it is close to *Horsfieldia glabra*, especially the var. *javanica;* see there.

5. Sinclair regarded the species as endemic to Penang Isl.

98. Horsfieldia punctatifolia Sinclair Fig. 1D(98)

Horsfieldia punctatifolia Sinclair, Gard. Bull. Sing. 16 (1958) 413, f. 44, pl. XIB: 28 (1975) 105 — Type: Singapore, fruits, *Sinclair SFN 40211* (= *Sinclair 7987*) (SING, *n.v.;* iso: K, L, P; BK, BO, DD, E, *n.v.*).

Tree 7-30 m. Twigs terete, not ridged, towards the apex 2.5-4(-10) mm diam., dark grey-brown, early glabrescent, tomentum grey-brown, of hairs up to c. 0.1 mm long; bark finely to ± coarsely striate, lower down not flaking; lenticles present but generally inconspicuous. Leaves in 2 rows, membranous, elliptic-oblong to oblong, broadest at about or slightly above the middle, 9-21 × 3.9 cm, base attenuate, top acute-acuminate; upper surface drying dull olivaceous to dark brown, lower surface glabrous, with scattered larger brown to blackish dots c. 0.05 mm diam.; midrib above flat or slightly raised; nerves 11-16 pairs, thin and flat above, marginal arches not distinctt; tertiary venation forming a lax network, not or hardly visible on both surfaces; petioles 10-17 × 1.5-3 mm, glabrous; leaf bud slender, 8-12 × 1.5-2.0 mm, with dense grey-brown tomentum, of hairs up to 0.1 mm long. Inflorescences sparsely pubescent with hairs up to 0.1 mm or glabrescent, in ♂; c. 3 times ramified, rather many-flowered, 4-10 × 2-8 cm, common peduncle 5-20 mm long; ♀ inflorescences c. 2 times ramified, 3-6 × 1.5-4 cm, fewer-flowered than in ♂: bracts ± oblong, c. 2-4 mm, short-pubescent, caducous. Flowers 3- or 4-valved, in ♂ in loose clusters of 2-5, glabrous, pedicels glabrous, at base inarticulate. Male perianths depressed-globose, 1.4-2.0 × 1.6-2.2 mm; pedicels 1.0-2.0(-2.5) mm, slender; perianth at anthesis cleft to ¾-⅘, valves 0.2-0.3 mm thick. Androecium depressed globose to depressed broadly ovoid, 0.6-0.7 × 1.0-1.5 mm, top broadly rounded, transverse section nearly circular; anthers 7-9 (14-18 thecae), completely sessile (free apices up to 0.1 mm), the apices of anthers concealing an apical, usually small, narrow, hollow up to 0.2 mm deep, in Sumatran specimens larger, up to c. 0.4 mm deep; androphore narrow, 0.1-0.2 mm long. Female perianth ellipsoid, 2.8-3.5 × 2.5-3.0 mm, glabrous, cleft at anthesis to c. ½-way, valves 0.3-0.5 mm thick; ovary broadly ovoid, 1.5-2.0 × 1.3-2.0 mm, glabrous, stigma ± irregularly 2-lipped, 0.2-0.3 mm high; pedicel 1-2 mm long. Fruits 1-3 per infructescence, ellipsoid to broadly ellipsoid, top and base rounded, glabrous, (4.5-)5.0-8.0 × (3.0-)3.5-4.5 cm, drying blackish brown, without or with a few small warts; dry valves 10-20 mm thick; stalks 4-6 mm long; perianth not persisting.

Distribution. Malaya, Singapore, Sumatra (North, E. Coast), Borneo (Sarawak, Sabah, C. & E. Kalimantan).

MALAYA (Perak, Selangor, Negri Sembilan, Malacca): *FRI 3345, 21674; KEP 76145; King's Coll. 4078; Maingay 1286; Sinclair SFN 40082.*

SINGAPORE. *Maxwell 80-157; Murton 76; Sinclair s.n., 7987, 9365, SFN 40211.*

SUMATRA. East Coast: *Bartlett 6990, 6991, 7300* — Tapanuli: *b.b. 5656* — Riouw: *b.b. 23216.*

BORNEO. Sarawak (4th, 7th Div.): *Jacob 6534; S 15917, 22673, 36580, 39341* — Brunei: *(Ashton) BRUN 317* — Sabah: *San. 26176, 26276, 30849, 32259, 32278, 66655, 72214, 88407; Sinclair (& Kadim) 9278.* — C. Kalimantan: *Mogea & de Wilde 4384; Veldkamp 8492* — E. Kalimantan: *(Kostermans) b.b. 35017; Kostermans 6713, 7414, 7461, 13623.*

Ecology. Primary forest incl. hill side forest, ridge top forest, pole forest, marshy forest, also kerangas forest; on a variety of soil types incl. grey soil, brown soil, sandy clay, tertiary sandstone, dacite hill; 0-1100 m alt. Flowers and fruits throughout the year.

NOTES.

1. Fieldnotes. Bark smooth but shallowly fissured to cracked, or brittle-scaly; inner bark pinkish to red, with reddish watery exudate; cambium white; slash wood white, yellowish, or pinkish; heartwood dark brown. Recorded as without or with low-rounded *or* steep thick buttresses. Perianths yellow to bright yellow, with a turpentine odour. Fruits yellow to red, apricot, orange or orange-brown flushed pink; pericarp pink inside; aril red.

2. The phyllotaxis in *S 15917* seems ± tristichous in the fruit-bearing twig-portion; in the leafy twig and in all other material seen the phyllotaxis is 2-stichous.

3. Sinclair records the fresh fruits (in *SFN 40211*, the type) as measuring c. 9 × 6 cm, pointed at both ends; fresh fruits collected in central Kalimantan (Mogea, Veldkamp) measured about the same size, with pericarp 20-25 thick.

4 .Sinclair regarded *H. punctatifolia* as characterized by the unique dark brown punctation of the leaves, not mentioning that several related species, including the variable *H. glabra*, have similar punctate leaves. Our present species is particularly distinguished by its deeply cleft male perianths, rather few anthers, and the large fruits with a thick pericarp.

99. Horsfieldia macrothyrsa (Miq.) Warb. Fig. 1D(99)

Myristica macrothyrsa Miq., Pl. Jungh. 1 (1852) 172; A DC., Prod. 14, 1 (1856) 203; Miq., Fl. Ind. Bat. 1(2), 1 (1858) 66; Suppl. 1 (1860) 156 — *Horsfieldia macrothyrsa* (Miq.) Warb., Mon. Myrist. (1897) 307; Heyne, Nutt. Pl. 1 (1927) 637 — Type: Sumatra, Tapanuli, Junghuhn (559) (U; iso: BM, K, L).

Tree 4-15 m. Twigs terete, not ridged, towards apex (2-)2.5-6(-8) mm diam., brown to blackish brown, early glabrescent, tomentum grey-brown to dull brown, of hairs c. 0.1 mm long, bark lower down finely striate, not flaking, lenticels usually distinct. Leaves in 2 rows, membranous, elliptic-oblong to oblong, broadest at or slightly above the middle, 12-28 × 4-12 cm, base attenuate, top acute-acuminate; upper surface drying olivaceous to dull brown; lower surface early glabrescent, with regularly spaced, pale brown to blackish, larger dots (no dashes) (lens × 30); midrib above flat or slightly raised; nerves 9-17 pairs, above thin, flat on ± raised (*Lörzing 1703*, see notes), marginal arches not distinct; tertiary venation forming a lax network, indistinct or invisible on both surfaces; petioles 12-20 × 2-4 mm, glabrous; leaf bud densely grey-brown to dull brown pubescent by hairs c. 0.1 mm, slender, 10-15 × 1.5-3 mm. Inflorescences rather sparsely pubescent by hairs c. 0.1 mm or less, in ♂: c. 3 times ramified, rather few-flowered, 7-20 × 5-12 cm,

common peduncle 5-45 mm long; ♀ inflorescences (according to the infructescences): c. 2 times ramified, 3-6 cm long; bracts elliptic-oblong, 2-4 mm long, short-pubescent, caducous. Flowers 3 (or 4)-valved, in ♂ in loose clusters of 2-4, in ♀ 1-3 together, glabrous; pedicels glabrous, at base not or but faintly articulated. Male perianth globose to (depressed-)broadly obovoid, 3-4.3 × 3-4 mm; pedicel 1-2 mm long, usually slender, well marked-off from the perianth; perianth in anthesis cleft to c. ½-way, valves 0.2-0.4 mm thick. Androecium globose, depressed globose or depressed broadly obovoid, 1.8-2.2 × 1.8-2.5 mm, in transverse section circular to bluntly 3- or 4-angled; anthers 15-22, completely sessile, free apices up to 0.1 mm long, towards apex somewhat curved into the apical cavity which is rather broad and 0.4-1.2 mm deep; androphore short and narrow, 0.1-0.4 mm long, hidden by the anthers. Female flowers not seen. Fruits 2-6 per infructescence, glabrous, ovoid-ellipsoid, 2.2-2.5 × 1.6-1.8 cm, top rounded, base (broadly) rounded, with or without a few small, lenticel-like tubercles, drying brown to blackish, dry valves 1.5-3 mm thick; stalk 2-5 mm long; perianth not persisting.

Distribution. Northern and Central Sumatra.

SUMATRA. Northern (incl. Tapanuli): *Junghuhn (559); Lörzing 11703, 17195, 17221, Nasution 67* — Central (Mt. Sago): *Jacobs 4667; Meijer 3474, 3680, 4029, 4572.*

Ecology. Lower and mid-mountainous forest, riverine forest; 400-1600 m alt. Flowers and fruits throughout the year.

NOTES

1. Fieldnotes. A small tree, only 4 to 15 m tall. Bark fissured or peeling somewhat; sap dark red-brown. Wood white to yellowish with red veins. Flowers greenish to yellow, aromatic. Fruits 2.5-3.5 cm long when fresh, ellipsoid, greenish to light yellow, valves light yellow inside, aril green (almost mature, as in *Lörzing 11703*), seed pale yellow.

2. The present species is closely related to *H. glabra* which has similar fruits, and flowers of a similar architecture. *H. macrothyrsa*, however, has markedly larger male flowers, and about twice as many anthers as compared with *H. glabra*. Apparently *H. macrothyrsa* also has a different distributional area; *H. glabra* is up to now not found in Central and North Sumatra.

3. Variation. The specimens presently brought together under the name *H. macrothyrsa* rather differ from each other in various aspects. The plants from Mt. Sago (= Mt. Malintang), C. Sumatra, are relatively weaker in general habit; leaves and inflorescences are smaller, the male perianths c. 3-3.5 mm diam. The plants from the Sibolangit Botanic Garden jungle (see note 4) are stout, with the leaves large (to 28 cm long), have large male perianths (c. 4.3 × 4.0 mm), and deviate furthermore by the rather raised nerves on the upper leaf surface (*Lörzing 11703*, and others, see note 4). The type-specimen (from Tapanuli) and a collection from Pematang Siantar (*Lörzing 17195*, ♂ fls.) are rather intermediate in habit, but have smaller male perianths (c. 3-3.5 diam.) as are the collections from Mt. Sago. *Lörzing 17195* deviates by short male pedicels which are only c. 1 mm long.

4. The specimens from the Sibolangit Botanic Garden jungle *(Lörzing 11703, 17221, Nasution 67)* are from specimens collected in 1926 (with fruits) and in 1937 and 1962 (fruits, ♂ flowers), and annotated as growing wild in large numbers. As

remarked under note 3, these specimens differ from the rest of the material and possibly represent a separate taxon.

5. Warburg (1.c. p. 308) describes the perianths of *H. macrothyrsa* as of c. 2 mm diam., although the type, seen by Warburg, clearly has the strikingly large globose perianths of c. 3.5 mm diam.

6. Sinclair included the present species in *H. glabra,* which was accepted by him as a very large and variable species.

100. Horsfieldia glabra (Bl.) Warb. Fig. 1D(100,100 b)

Myristica glabra Bl., Bijdr. 2, 11 (1826) 576; Rumphia 1 (1837) 191, t. 64 fig. 1; Miq., Pl. Jungh. (1852) 172; Fl. Ind. Bat. 1(2), 1 (1858) 65 (excl. *M. integra* Wall.); Ann. Mus. Bot. Lugd.-Bat. 2, 1 (1865) 49 (excl. var. *sumatrana*) — *Pyrrhosa glabra* (Bl.) Hasskarl, Cat. Pl. Hort. Bog. (1844) 174 — *Horsfieldia glabra* (Bl.) Warb., Mon. Myrist. (1897) 313, t. 21 fig. 1-2 (p.p.); Sinclair, Gard. Bull. Sing. 16 (1958) 411 (p.p., for the basionym only); 28 (1975) 35 (p.p.); Backer & Bakh. f., Fl. Java 1 (1963) 138 — Syntype: Java, *Blume* (several sheets, L).

Myristica glabra var. *grandifolia* Miq., Fl. Ind. Bat. 1(2), 1 (1858) 65; Suppl. 1 (1860) 156 — Type: W. Coast Sumatra, *Teijsmann s.n.* (U).

Tree 6-25 m. Twigs terete, towards apex 2-4(-8) mm diam., brown to blackish brown, not ridged, early glabrescent, tomentum from grey-brown to rusty, of hairs up to 0.2 mm long, lower down bark usually finely striate, not flaking, lenticels usually conspicuous, especially towards the apex. Leaves in 2 or 3 rows, membranous to thinly coriaceous (and very brittle when dry), elliptic or obovate to oblong-lanceolate, broadest at or usually above the middle, 8-27 × 3-10.5 cm, base short- to usually long-attenuate or gradually tapering from about the middle to the petiole, top acute to acute-acuminate; upper surface drying olivaceous-brown to dark-brown; lower surface early glabrescent, with regularly scattered brown to blackish-brown or rarely pale brown, larger dots (not dashes) (lens, × 30); midrib above flat; nerves 8-16 pairs, above thin, flat or sunken, or in var. *glabra* sometimes faintly raised especially towards the base, marginal arches not distinct; tertiary venation forming a lax network, indistinct or invisible on both surfaces; petioles 10-15 × 1.5-2.5 mm, glabrous (early glabrescent); leaf bud densely grey-brown to rusty pubescent with hairs 0.1-0.2 mm, slender, 7-12 × 1.5- 2.5 mm, on 3-stichous twigs slightly thicker. Inflorescences densely to sparsely pubescent with hairs up to c. 0.1 mm long, sometimes glabrescent, in ♂: (2 or) 3 (or 4) times ramified, rather many-flowered, 5-10 × 4-7 cm, common peduncle 4-15 mm long; ♀ inflorescences 1 or 2 times ramified, 2-4 × 1-3 cm; bracts elliptic-lanceolate, c. 2-5 mm long, short-pubescent, caducous. Flowers (2-) 3- or 4-valved, in ♂ (2-)3-5 in loose clusters, in ♀ solitary or 2 or 3 together, glabrous; pedicels glabrous, at base either not or more or less distinctly articulate, usually mixed in one inflorescence. Male perianth globose (var. *glabra*) or broadly ellipsoid or obovoid (vars. *javanica* & *oviflora*), 1.5-2.5 mm long (see further under the varieties); pedicel slender (vars. *glabra & javanica*) or thickish (var. *oviflora*,; perianth at anthesis cleft to c. ½-⅔, valves 0.2-0.3 mm thick. Androecium (depressed-)globose (var. *glabra*) or ellipsoid or short-obovoid (vars. *javanica* & *oviflora*), anthers 9-15, almost completely sessile; androphore short and narrow, (0-)0.1-0.2 mm long; see further under the varieties. Female perianth ellipsoid, 2.5-3 × 2.2-2.5 mm, glabrous, cleft at anthesis to c. ⅓ to nearly ½-way, valves 0.4-0.5 mm thick; pedicel 0.5-1.5 mm long; ovary ovoid, 1.5-2 × 1.2-1.5 mm, glabrous, stigma minutely 2-lobed, c. 0.1 mm high (var.

glabra) or if broad-lipped then 0.2(-0.3) mm high (var. *oviflora*). Fruits 2-6 per infructescence, ovoid-ellipsoid, top rounded, base rounded to broadly rounded, glabrous, 1.8-2.4 × 1.4-1.9 cm, drying blackish brown, without lenticel-like tubercles; dry valves 1-2.5 mm thick; stalk 1-2.5 mm long; perianth not persisting.

Distribution. S. Sumatra, Mentawai Isl. north to Simeuluë (Simaloer Isl.), Java; in Java three varieties.

NOTE. In *H. glabra* the lower leaf surface is always coarsely punctate with dark brown non-traumatic cork warts, a character which was regarded by Sinclair as exclusive for the related *H. punctatifolia* and which it resembles vegetatively.

KEY TO THE VARIETIES

1a. Male perianth globose or subglose, 1.7-2.5 mm diam., at anthesis cleft to c. ½-⅔; androecium globose or depressed-globose, circular or faintly 3-angular in transverse section; pedicel ± slender. Leaves membranous to chartaceous, nerves flat or slightly raised above. Fruit 18-24 mm long. Area as the species; 0-600 m. alt. ..... **a.** var. **glabra**

b. Male perianth broadly ellipsoid to broadly obovoid, at anthesis cleft to c. ½-way; androecium ellipsoid to obovoid, blunt-triangular in section 2

2a. Male perianth ellipsoid, c. 1.5 mm long; androecium ellipsoid; pedicel slender. Leaves membranous, nerves flat. Fruit not seen. E. Java ..... **b.** var. **javanica**

b. Male perianth broadly ellipsoid-obovoid, 20-2.5 mm long; androecium broadly ellipsoid-obovoid; pedicel rather short and thickish. Leaves chartaceous to subcoriaceous, nerves flat or sunken above. Fruit 18-20 mm long. W. & C. Java, 500-1500 m alt. ..... **c.** var. **oviflora**

a. var. **glabra** Fig. 1D(100)

Leaves membranous to chartaceous, up to 27 cm long; nerves above flat or slightly raised. Male perianth globose, 1.7-2.5 mm diam., at anthesis cleft to c. ½-⅔; valves 3 or 4, c. 0.2-0.3 mm thick; pedicel relatively slender, well marked-off from the perianth. Androecium globose or depressed-globose, 0.8-1.3(-1.5) × 1.3-1.6 mm, circular or faintly 3-angular in transverse section; anthers 10-15, almost completely sessile, free apices up to 0.1 mm, curved over towards apex and ± into the apical cavity which is rather broad, 0.3-0.5 mm deep; column broad and solid; androphore short, narrow, up to 0.2 mm long. Female flowers: stigma minutely 2-lobed, c. 0.1 mm long. Fruits 1.8-2.4 cm long.

Distribution. As the species.

SUMATRA (Central & South): *Jacobs 8375; Korthals s.n.* — Simaloer (Simeuluë) & Enggano Isl.: *Achmad 205, 1342; Lütjeharms 4259, 4420, 4422.*

JAVA (mainly W. & C.): *Backer 1163; Bakhuizen v.d. Brink 5444, 5516, 6780; b.b. Ja. 2585, 2617; Blume 2206 (a/b), 2160 (B); van Borssum Waalkes 799* (Pulau Panaitan); *Sinclair 10047, 10048; H.L.B. 565; Hochreutiner 2290;* Herb. Legd. Bat./*Houtsoorten Gedeh 243, 362, 378, 644; Junghuhn s.n., 230; Koorders* (ß) *5198, 5200, 5208, 5284, 13145, 14615, 20173, 20242, 22690, 23711, 24292, 25585, 25595, 26937, 30471, 34030; Kostermans 11133, 23017, 23889; Loos s.n.; Teijsmann s.n.* (1867); *Warburg 11007; Wirawan 95.*

Ecology. Primary and secondary forest, also in coastal forest on limestone; 0-800 m alt. Flowers and fruits throughout the year.

Vernacular names. Java: Ki-mokla lentik (Djasilin Sund.); Ki-lalakina, Ki-minjak, Ki-sareni (Gedeh); Kelapa tjioen, Kelapa, tjiung, Kelapa tjún — Sumatra:

Bonauw falah, Soemaralah silai delok (Simaloer Isl.); Prianggoe Epoekha (Enggano Isl.).

NOTES

1. Fieldnotes. Bark smooth to roughish, shallowly longitudinally fissured. Flowers yellow, smelling of Peru-balsam. Fruits glossy greenish-orange, fresh valves to c. 4 mm thick; aril bright orange.

2. Phyllotaxis is 2- or 3-stichous, sometimes mixed in one collection in specimens from Java; all specimens from Sumatra are distichous.

3. The male perianths of the Sumatra specimens are faintly ellipsoid, rather than strictly globose as in Java.

b. var. **javanica** de Wilde, *var. nov.* Fig. 1D(100b).

Gemmae foliorum tomento pilis 0.1-0.2 mm longis composito obtectae. Folia membranacea, subtus punctis nigrescentibus obsita, nervis supra planis. A var. *glabra* perianthio masculino ellipsoideo ca. 1.5 mm longo atque androecio ellipsoideo differt. — Type: Java, *Koorders 5210ß* (L).

Leaves membranous, 9-12 cm long, nerves above flat. Male perianth ellipsoid, c. 1.5 × 1.2-1.3 mm, in anthesis cleft to c. ½-way; valves c. 0.1-0.2 mm thick; pedicel slender. Androecium ellipsoid, above subtruncate, 1.0-1.2 × 0.7-0.8 mm, blunt-triangular in transverse section; anthers 9-15, completely sessile, free apices 0-0.1 mm, at apex not or only slightly incurved; apical cavity small and narrow, c. 0.1-0.2 mm deep; column solid; androphore very short, narrow, up to 0.1 mm long. Female flowers and fruits not seen.

Distribution. Java, possibly only in E. Java; the two known collections are from Java without further locality (*Koorders 5210ß*, the type) and from E. Java (Besoeki, *Koorders 21635),* without notes on altitude or habitat.

NOTES

According to the flowers this variety seems very related to *H. penangiana,* also with dotted leaves and with the perianth of similar size and shape (partly), but with the androecium round in transverse section and with fewer anthers, 5-9(-10); also, in *H. penangiana* the habit of the twigs is more slender, the leaves generally smaller. However, *H. penangiana* as accepted by me is variable (especially in flower shape) and might include the present *H. glabra* var. *javanica* when more material of both taxa becomes available.

The specimens of the present variety were determined by Sinclair as *H. glabra.*

c. var. **oviflora** de Wilde, *var. nov.*

Gemmae foliorum tomento pilis 0.1-0.2 mm longis composito obtectae. Folia subcoriacea, subtus punctis sparsis obsita, nervis supra planis vel immersis. A var. *glabra* perianthio masculino ellipsoideo-obovoideo 2-2.5 mm longo atque androecio ellipsoideo-obovoideo differt — Type: C. Java, *b.b. Ja, 3827* (L).

Leaves chartaceous to subcoriaceous, 8-15 cm long; nerves above flat or sunken. Male perianth broadly obovate-ellipsoid, 2.0-2.5 × 1.7-2.3 mm, in anthesis cleft to

c. ½-way; valves 0.2-0.3 mm thick; pedicel c. 1 mm long thickish. Andoecium ellipsoid-obovoid, top subtruncate, 1.2-1.8 × 0.8-1.0 mm, blunt-triangular in transverse section; anthers 10-15, ± completely sessile, free apices 0.1-0.2 mm, at apex little in-curved; apical cavity narrow to rather broad and deep, reaching to nearly half-way the central column, 0.4-1.0 mm deep; androphore narrow, short, (0-)0.1(--0.2) mm long. Female flowers: stigma broadly 2-lipped, 0.2-0.3 mm high. Fruits rather small, 1.8-2.0 × 1.4-1.6 cm.

Distribution: W. and C. Java.

JAVA, b.b. *Ja. 3837; Koorders 5197β, 5204, 27874β; Kostermans s.n.* (May 1968), *s.n.* (Jan. 1971).

Ecology. Forest at 600-1500 m. Flowers throughout the year, fruits in June.

Vernacular names. Kalak katjoeng, Woeroe timah.

NOTES

1. Fieldnotes. Bark smooth. Flowers yellow, smelling of Peru-balsam.

2. I have the impression that the phyllotaxis of all 6 specimens seen is 3-stichous.

3. Sinclair included specimens of the present variety in *H. glabra* s.l. Possibly the new variety represents a separate species, mainly because of the essentially different shape of perianth and androecium, but because of the rather poor material at hand I have kept it under *H. glabra*.

Excluded

As explained under the description and redefinition of the genus *Horsfieldia* I have excluded the species of the *Horsfieldia macrocoma*-complex as published by Sinclair (1958) for Malaya and as the specimens enumerated by Sinclair (1975) for its whole area. The species of this *H. macrocoma*-complex have been removed into a new genus *Endocomia*, published in *Blumea* (1984). Under the genus *Endocomia* go over 20 names (mostly combinations in *Horsfieldia*) formerly treated in relation to *Horsfieldia*. These names have presently all been included in the Index and are referred to as 'excl.' (excluded). Their identity can be found through the index with the article on *Endocomia* in *Blumea*.

Further excluded are:

Horsfieldia Bl. *ex* A. DC., Prod. 4 (1830) 87, *non* Willd., 1805 = Harmsiopanax Warb. (Aral.).

Horsfieldia aculeata BL. *ex* DC. = *Harmsiopanax aculeatus* (Bl. *ex* DC.) Warb. *ex* Boerl. (Aral.).

Horsfieldia peltata Benth. in Benth. & Hook. f., Gen. Pl. 1 (1862) 937 = *Harmsiopanax aculeatus* (Bl. *ex* DC.) Warb. *ex* Boerl. (Aral.).

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Dr. R. C. van den Brink supplied the latin translations for almost all the diagnoses of new taxa and Mr. J. Van Os prepared the beautiful drawings.

Errata

Horsfieldia Pt	Gdns' Bull. yr; vol.: pg	Corrections
1	1984; 37: 124	In 'Table 1', column 1, transpose the symbol '+' for 1. *H. iryaghedi* to line 2 for *H. kingii.*
2	1985; 38: 87	In '2. Variation and resembling species', *H. salicifolia* is an error for *Myristica salicifolia.*

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Index of Names

Names that are new are printed in bold, those accepted by the author are in roman, and synonyms are in italics. Numbers in bold are ordinal numbers of descriptions in this work whereas those in roman are page numbers, and these refer to the Gardens' Bulletin vol. 37(2).

labillardieri Warb. = **6**
laevigata (Bl.) Warb. = **35**
var. laevigata = **35a**
var. **novobritannica** (Sinclair) de Wilde = **35b**
lancifolia de Wilde = **37**
lauterbachii Warb. = **29a**
laticostata (Sinclair) de Wilde = **79**
lemanniana auct. = **81a**
lemanniana (A. DC.) Warb. = **6**
leptantha de Wilde = **43**
leptocarpa Warb. = excl.
leptosperma, nom. = excl.
longiflora de Wilde = **3**
longipedunculata H.H. Hu = excl.
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macrobotrys Merr. = **60**
macrocoma (Miq.) Warb. = excl.
var. *canarioides* (King) Sinclair = excl.
var. *macrocoma* = excl.
var. *rufirachis* Sinclair = excl.
macrothyrsa (Miq.) Warb. = **99**
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var. moluccana = **9a**
var. **petiolaris** de Wilde = **9b**
var. **pubescencs** de Wilde = **9d**
var. **robusta** de Wilde = **9c**
montana Airy Shaw = **89**
motleyi Warb. = **60**
nervosa de Wilde = **80**
nesophila auct. = **29a**
nesophila (Miq.) Warb. = **35a**
novae-lauenburgiae Warb.: see **35b**
novo-guineensis Warb., p.p. = **27, 36**
novo-guineensis Warb., pro lectotype = **28**
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papillosa Warb. = excl.
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paucinervis Warb. = **63**
peltata Benth. = excl.
penangiana Sinclair = **97**
pilifera Markgraf = **36**
polyantha auct. = **31**
polyantha Warb. = **35a**
polyspherula (Hook. f. emend. King) Sinclair = **81**
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var. polyspherula = **81a**
var. **sumatrana** (Miq.) de Wilde = **81b**
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ralumensis auct. = **35b**
ralunensis Warb. = **45**
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reticulata Warb. = **67**
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subsp. subalpina = **92a**
subglobosa auct. = **81b**
subglobosa (Miq.) Warb. = **6**
var. *brachiata* (King) Sinclair = **72**
var. *subglobosa* auct. = **81b**
subtilis (Miq.) Warb. = **29**
var. **aucta** de Wilde = **29c**
var. **calcarea** de Wilde = **29b**
var. rostrata (Markgraf) Sinclair = **29d**
var. *schlechteri* (Warb.) Sinclair = **30**
var. subtilis = **29a**
sucosa auct. = **50**
sucosa (King) Warb. = **48**

tingens Bl. = **10**
tomentosa Hook. f. & Th., *nom. illeg.* = **61**
tuberculata K. Sch. = **39**
valida Miq. = **84**
vrieseana Miq. = **6**
wallichii Hook. f & Th. = **57**
Palala
aruana Rumph. = **28**
canariformis Rumph. = **7**
dentaria Rumph. = **7**
globularia Rumph. = **10**
"kitjil" Rumph. = **10**
minima Rumph. = **10**
quarta Rumph. = **7**
quinta Rumph = **10**
tertia Rumph. **10**
tingens Rumph. = **10**
? Phelima Noronha = **1**
Pyrrhosa Endl., *nom. illeg.* = Horsfieldia Willd.
glabra (Bl.) Hassk. = **100**
globularia (Bl.) Hassk. = **10**
horsfieldii (Bl.) Hassk. = **1**